Thomas Creek Restoration Project

Fisheries Specialist Report

And

Biological Evaluation

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Introduction

The purpose and need and proposed action are described in the Thomas Creek Project Description (USDA Forest Service 2014a). Four action alternatives were developed to address the purpose and need (USDA Forest Service 2014b). The Thomas Creek Project area is the 15,774 acres and encompasses about 3,000 acres in the Umatilla River Subbasin (HUC 17070103) and 13,000 acres within the Grande Ronde River Subbasin (HUC 17060104). The Umatilla River is a tributary to the Columbia River and the Grande Ronde River is a tributary to the Snake River.

This report evaluates the aquatic species and habitat conditions and discloses the potential direct, indirect and cumulative effects of the alternatives for the Thomas Creek Restoration Project (Thomas Creek Project). The specie(s) and habitats evaluated for this project include : Bull trout *Salvelinus confluentus* and their designated critical habitat (DCH), Middle Columbia River steelhead *Oncorhynchus mykiss* and their designated critical habitat (DCH), Snake River Basin steelhead *Oncorhynchus mykiss* and their designated critical habitat (DCH), Snake River Spring/Summer Chinook salmon *Oncorhynchus tshawytscha* and their designated critical habitat (DCH), Essential Fish Habitat (EFH), aquatic management indicator species (MIS) and Region 6 Regional Forester Sensitive Species. This report evaluates the effect of the project on Essential Fish Habitat (EFH) as designated by the Magnuson-Stevens Fishery Conservation and Management Act.

The Thomas Creek Restoration Specialist Report and Biological Evaluation was prepared in accordance with the following guidance and direction:

- Section 7(a)(2) of the Endangered Species Act of 1973 (as amended),
- Magnuson-Stevens Fishery Conservation and Management Act (§ 305(b)) and it's implementing regulations (50CFR § 600).
- National Forest Management Act of 1976
- Clean Water Act of 1972
- Land and Resource Management Plan – Umatilla National Forest (1990) as amended by PACFISH (1995)

Description of Project Alternatives

Five alternatives, including the no-action alternative, were developed as part of the Thomas Creek Restoration Project. Each action alternative was designed to meet the project purpose and need while addressing the issues identified from public scoping. The five alternatives are summarized below. Table 1 below provides summary comparison numbers for silvicultural treatments, riparian habitat conservation area treatments, and roads. A complete description of alternatives can be found in the Thomas Creek EA.

Alternative A - the No Action Alternative
Alternative A is the no action alternative. Under this alternative, no activities identified in the proposed action for the Thomas Creek project would occur.

Alternative B – the proposed action

Alternative B is the proposed action. Alternative B proposes to use a combination of treatments to restore vegetation in the Thomas Creek project area by increasing ecosystem resiliency and meet the identified purpose and need for this project, while providing wood products for utilization by local and regional industry.

The proposed actions in Thomas Creek project would restore both upland and riparian areas in the project area through mechanical (commercial timber harvest) or hand (manual chainsaw, i.e. non-commercial thinning) vegetation management methods. Natural and assisted reforestation, site preparation for natural or assisted regeneration, sub-soiling, placement of large woody debris in streams, post-harvest fuels management, and prescribed fire are also included in the proposed action.

A variety of even age, two aged, variable density and intermediate type treatments are proposed. In stands where off-site ponderosa pine occupies more of the growing space, removal of the pine and regeneration of an alternate species is prescribed. 942 acres of historic ponderosa pine plantations are proposed for treatment in Alternative B.

The proposed action includes 1,276 acres of non-commercial thinning. Hand methods would be used. No additional slash treatments would be needed when thinning by hand. Material would be pulled back from road ditches and fence lines by hand.

Treatments are also proposed for a subset of Riparian Habitat Conservation Areas (RHCAs). The objective of these treatments is to move streams and riparian areas within the project area that do not currently meet Riparian Habitat Management Objectives (RMOs) as defined in PACFISH (Forest Plan) toward those RMOs.

Under Alternative B, commercial and non-commercial treatments are proposed Category I, II and IV RHCAs. The project has identified 28 acres of Category II and 155 acres of Category IV RHCAs for commercial treatments. In addition to those commercial treatments, 172 acres of Category I, 101 acres of Category II and 234 acres of Category IV RHCAs are proposed for non-commercial treatments.

1.0 miles of temporary road are proposed for construction and 13.6 miles of closed road are proposed to be opened for haul.

Comment [HHA-1]: It's actually 1.5, but the additional 0.5 is on existing roadbeds).

Comment [DWM-2]: I looked through Zig's report and he only talks about 1.0 miles of new Temp road construction.

Alternative C

Alternative C proposes to implement an experimental design with treatment units to study edge management, hardwoods, and other aspects of historic plantations.

Alternative C proposes a learning design composed of three experimental contrasts, as described below. These contrasts would be implemented by two types of silvicultural treatments unique to Alternative C (Edge – Hardwoods (HW) and Edge + HW), and 3 different types of monitoring (NoGo, NoEdge + HW, and NoEdge-HW).

Go/no-go contrast
The experimental question under this contrast is whether or not to manage historic plantations (old harvest units, or OHU's). The objective of the "Go" treatment is the same as discussed under the purpose and need section of this document- to manage the landscape towards the range of variation, reduce detrimental soil conditions, and to manage RHCA's towards desired conditions. The objective of the "NoGo" treatment is to allow OHU's to continue their development without management, and to establish a control group for the Go treatments.

Edge/NoEdge contrast
The experimental question under this contrast is whether or not to manage a 100 foot buffer outside the boundary of the OHU's. The objective of this contrast is to increase both ecological

and societal community benefits. Under the Edge treatment, additional commercial harvest would take place outside the OHU, with planting of larch and Douglas-fir in order to maximize the success of management inside the OHU by reducing mistletoe, grand fir seed, insects, undesired windthrow, etc. Under the No Edge treatment, no active management would take place outside the OHU. The No Edge treatment units would be monitored in conjunction with the Edge treatment units to determine differences within this contrast.

(+/-)Hardwoods (HW)contrast
The experimental question under this contrast is whether to increase hardwoods or reduce them. The main objective for this contrast is to evaluate the possible role hardwoods play in providing an expanded set of long-term community and ecological benefits, including increased aquatic and songbird productivity and increased water-holding capacity, soil organic matter, and nitrogen to increase productivity and resilience of residual conifers. Under the (+) hardwoods treatment, the desired outcome is to create a mixed early-seral community of larch, Douglas-fir, and hardwood shrubs (with a focus on alders) in openings. Alders may be planted if necessary. Under the (-) hardwoods treatment, the desired outcome is to maximize young conifer seedlings, and in the process minimize hardwood cover, to aid in determining if hardwoods do contribute significantly to soil production and browser food chains.

This alternative includes establishing no action "control" groups which would not be managed as proposed under Alternative B. Approximately 62 acres of commercial harvest proposed for management under Alternative B would be managed similarly to the no action alternative in Alternative C. These are the control units of the experimental design.

Alternative C includes 1,468 acres of non-commercial thinning.

To accomplish the proposed restoration activities the same transportation system and access management is proposed under Alternative C as is described in Alternative B.

Alternative D
Activities in Alternative D would occur under the framework of Alternative B but on fewer acres. To develop Alternative D, each temporary road and miles of road reconstruction proposed under Alternative B were evaluated and prioritized based on both economic cost of the road work and severity of restoration need. Portions of Forest Roads 3148 and 3100231 would not be considered for road reconstruction under Alternative D. Additionally, no temporary roads would be used. Alternative D proposes no commercial treatment in RHCAs.

Alternative E

Activities in Alternative E are designed to respond to the agency's purpose and need for action outlined in Alternative B while responding to the key topic of jobs and economics. In addition to the vegetation management prescriptions proposed under Alternative B, Alternative E would include an additional 522 acres of commercial harvest outside the footprint of stands with previously documented systematic harvest. To accomplish the proposed restoration activities the same transportation system and access management is proposed under Alternative E as is described in Alternative B.

Treatments common to all action alternatives

Phillips Creek LWD placement

Phillips Creek is the major fish bearing stream in the project area that has been identified for restoration needs to improve channel morphology and in-stream processes. This project proposes to add wood adjacent to old clearcuts and ponderosa pine plantations within the upper 5 miles of Phillips Creek. The addition of large woody material would improve floodplain function by adding large roughness elements that help dissipate high flow energies. Large woody material would be brought in from off-site or may also be strategically felled toward/into streams during thinning. Forest Service aquatic specialists would work closely with the layout crew to identify trees and falling strategies.

The Thomas Creek Project does not include detailed design specifications for the locations, amounts, arrangement, or construction of large woody material. All specifications and design features associated with wood size, configuration and placement would conform to OWEB, ODF/ODFW and NMFS ARBO II (2013) standards.

Riparian hardwood planting and/or release

The Thomas Creek Project also proposes to increase riparian shade by releasing and/or planting understory alder and willow and improving the vigor and density of overstory cottonwood communities. Thinning would occur within the limitations of Forest Plan S&Gs and of the design features. Plant stock for native trees, shrubs and grasses would be from local seed sources that are adapted to growing conditions at the project site.

Danger tree felling/removal

This activity would occur along haul routes and within treatment units. Danger trees felled inside RHCAs would be left on the ground and no ground disturbance would occur. Removal of danger trees outside of RHCAs would be allowed.

Table 1. Comparison of silvicultural treatments, riparian habitat treatments, and roads by alternative

Activity	Alternative			
	B	C	D	E
Silvicultural Treatments (Acres)	2,546	2,598	2,417	3,068
Tractor Yarding	765	814	494	928
Forwarder Yarding	374	430	398	572
Skyline Yarding	164	84	57	292
Hand Thinning	1,276	1,270	1,468	1,276
*Vegetation Treatments in Riparian Habitat Conservation Areas (RHCA's)**				
Category I (non-commercial)	172	172	172	172
Category II (commercial)	28	5	0	28
Category II (non-commercial)	101	100	102	101
Category IV (commercial)	155	145	0	155
Category IV (non-commercial)	234	233	370	234
Fuel Treatment Acres				
Lop and Scatter (NCT)	1,276	1,230	1,468	1,276

Hand Pile (A4 treatment area)	38	38	38	60
Landing Pile (whole tree yard)	923	925	578	1,221
Grapple Pile	347	403	371	572
Pile Burn, hand and grapple piles (5% of area)	20	22	21	32
Pile Burn, landing piles (5% of area)	46	46	29	61
Jackpot Burn (~50% of surface)	305	305	285	305
Broadcast Burn (~80% of surface)	122	109	107	122
Landscape Burn	984	984	984	984
Transportation and Access				
Haul Routes, mi.	45.8	44.6	39.6	54.3
Haul Routes in RHCAs, mi.	15.0	14.9	13.9	15.8
Stream Crossings on Haul Routes	97	96	87	107
ML 1 roads temporarily opened, mi.	13.6	12.7	10.0	18.5
New Temporary road construction, mi.	1.0	0.75	0.0	1.0
ML 1 and Temporary roads in RHCAs, mi.	1.8	1.6	1.1	2.3
Re-installed Temporary drainage crossings	1	1	0	1

*Acres listed under Vegetation Treatments in Riparian Habitat Conservation Areas heading are already included in the total acres by silvicultural treatment (i.e. Vegetation treatments in RHCA's are not additional acres from totals above).

Summary of Effects

Below, in Table 2, is the summary of effects for the Thomas Creek Restoration Project on ESA listed and sensitive fisheries and aquatic species. The effects determinations listed in Table 2 are for the silvicultural treatments, prescribed fire/fuels treatments and road management activities, particularly those within the RHCAs.

The instream restoration treatments in the Thomas Creek Restoration Project will follow the Terms and Conditions of an existing programmatic aquatic restoration Biological Opinion. LWD restoration activities have already been consulted programmatically under the regional programmatic Aquatic Restoration Biological Assessment (ARBA) and Biological Opinion (ARBO). Terms and Conditions of an existing programmatic aquatic restoration Biological Opinion would ensure that the instream project work May Affect but is Not Likely to Adversely Modify or Destroy Designated Critical Habitat.

Discussions on direct, indirect, and cumulative effects leading to determination of effects begins on page 36 of this report.

Table 2.Summary of Effects by Alternative

Effects Determinations[1] by Alternative					
Species	**Alternative A**	**Alternative B**	**Alternative C**	**Alternative D**	**Alternative E**
Snake River Basin Steelhead and DCH	NE	MA-NLAA / NLAMD	MA-NLAA / NLAMD	MA-NLAA / NLAMD	MA-NLAA / NLAMD
Mid-Columbia River Steelhead and DCH	NE	NE	NE	NE	NE
Snake River Spring Chinook salmon and DCH	NE	NE	NE	NE	NE
Essential Fish Habitat (EFH)	NE	NE	NE	NE	NE
Bull trout and DCH	NE	NE	NE	NE	NE
Western Ridged Mussel	NI	NI	NI	NI	NI
Shortface Lanx	NI	NI	NI	NI	NI

[1] NE = No Effect; MA-NLAA = May Effect, Not Likely to Adversely Affect Individuals; NLAMD = Not Likely to Adversely Modify or Destroy (Designated Critical Habitat or Essential Fish Habitat); MAA = May Adversely Affect; NI = No Impact to individuals or their habitat

Scale of Analysis and Affected Environment

The Thomas Creek Restoration Project is proposed in the headwaters of the Willow Creek Watershed (HUC 1700610408), Cabin Creek-Grande Ronde River Watershed (HUC 1706010411) and Headwaters Umatilla River Watershed (HUC 1707010301) in Umatilla and Union Counties, Oregon.

The Willow Creek and Cabin Creek-Grande Ronde River Watersheds are part of the Upper Grande Ronde River Sub-basin and the Lower Snake Basin, a tributary to the Mid-Columbia River. The Headwaters Umatilla River Watershed is part of the Umatilla Sub-basin and a tributary to the Mid-Columbia River. The combined watershed areas are approximately 248,783 acres, of which 112,835 acres (45 percent) are managed by the US Forest Service (USFS). See Table 3.

The Headwaters Umatilla River watershed will be the analysis area for cumulative effects on Mid-Columbia River steelhead and Designated Critical Habitat. The Cabin Creek-Grande Ronde River watershed and Willow Creek Watershed make up the analysis area for cumulative effects on Snake River Basin steelhead and Snake River spring Chinook salmon and Designated Critical Habitat of each species. The three watersheds combined will make up the analysis area for

cumulative effects to Essential Fish Habitat. The Headwaters Umatilla River, Cabin Creek-Grande Ronde River and Willow Creek watersheds contain the Thomas Creek project area. Table 4 shows acreage of the Thomas Creek Project area within each of the watersheds.

Table 3. Management of Watersheds affected by the Thomas Creek Project

Manager	Acres	Percent
US Forest Service (Umatilla NF, Wallowa-Whitman NF)	112,835	45%
Other (BIA, BLM, Private and State)	135,948	55%
Total	248,783	100%

Table 4. Project Area acreage within each watershed

Watershed Name (HUC)	Watershed Size (acres)	Project Acres in Watershed	% Watershed in Project Boundary
Headwaters Umatilla River Watershed (HUC 1707010301)	86,795	2,962	3.4
Cabin Creek-Grande Ronde River Watershed (HUC 1706010411)	108,401	7,480	7.2
Willow Creek Watershed (HUC 1706010408)	53,587	5,332	10.0

TES and MIS Aquatic Life Histories

Threatened, Endangered and Sensitive (TES) Fish and Habitat
Snake River Basin (SR) steelhead, Middle Columbia River (MCR) steelhead and their designated critical habitats, Bull trout and their designated critical habitats and Snake River Spring/Summer Chinook salmon and designated critical habitats and salmon essential fish habitat are the only species and habitats listed under the Endangered Species Act (ESA), which are found in or adjacent to the project area. Information on the Regional Forester's sensitive species suspected or known to occur on the Umatilla National Forest can be found in Table 7.

Management Indicator Species (MIS)
Steelhead trout (anadromous) and resident rainbow trout (aka redband trout) are the designated aquatic Management Indicators Species (MIS) for the Umatilla National Forest. The Forest Plan was amended in 1995 by PACFISH which incorporated standards and guides to allow for near-natural rates of habitat restoration, and avoid adverse effects to listed species and their Designated Critical Habitats. Streams surveys and broadscale efforts, i.e. PACFISH/INFISH Biological Opinion, (aka "PIBO") monitoring, are in place to collect data and monitor habitat conditions.

Snake River Basin steelhead, Middle Columbia River steelhead and their Designated Critical Habitats
Wild steelhead and resident interior Columbia Basin redband trout in the analysis area, are the anadromous and resident forms respectively, of the same salmonid subspecies (Oncorhynchus

mykiss gairneri) Redband trout are another name for native resident rainbow trout in the Interior Columbia River Basin and are indistinguishable visually from the anadromous form as juveniles. Steelhead rear in freshwater streams for their first 1 to 3 years prior to smolting. They then migrate to the ocean where they can spend up to 3 years before returning to their native freshwater stream to spawn. Unlike Pacific salmon, steelhead are iteroparous, meaning they do not necessarily die after spawning and are able to spawn more than once, although this varies among runs.

Steelhead in the analysis area display a broad life history pattern of spawn timing typically called summer-run. Steelhead spawning occurs between March and May. Prior to spawning, maturing adults hold in pools or in side channels to avoid high winter flows. Typically, they spawn in stream reaches with a moderate to high gradient. Fry typically emerge between April and June. Migration to the ocean typically occurs at age 2 for wild summer steelhead, while most hatchery smolts migrate at age 1 (Carmichael and Taylor, 2009).

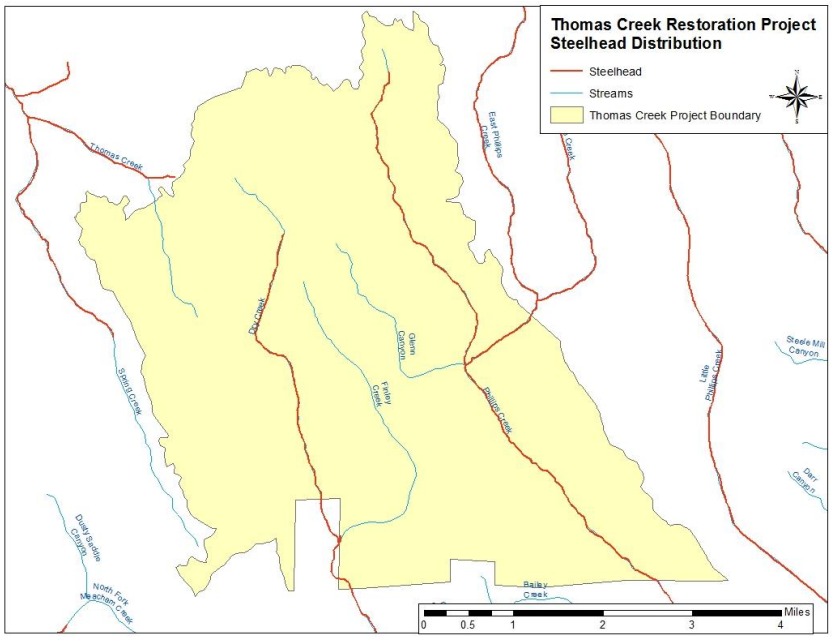
The steelhead population utilizing the Thomas Creek project area is part of the Grande Ronde River Major Population Group (MPG), within the Snake River Basin Steelhead DPS. Middle Columbia River Steelhead are known to utilize streams adjacent to the Thomas Creek project area. They are part of the Umatilla/Walla Walla Rivers Major Population Group (MPG), within the Middle Columbia River Steelhead DPS. Figure 1 shows the Steelhead distribution within and adjacent to the Thomas Creek project area. Table 5 shows how many miles of streams are occupied by steelhead in each watershed.

Table 5. Miles of stream occupied by steelhead within each watershed and the project area

Distinct Population Segment (DPS)	Watershed			Thomas Creek Project Area
	Headwaters Umatilla River	Cabin Creek – Grande Ronde River	Willow Creek	
Snake River Basin steelhead	-	79.0	29.7	11.8
Mid-Columbia River steelhead	41.0	-	-	-

According to the Oregon Middle Columbia Steelhead Recovery Plan (Carmichael and Taylor 2009), the Umatilla/Walla Walla River Summer Steelhead population is at moderate risk. All three populations, within the Umatilla/Walla Walla River MPG, have lost spawning habitat and the distances between occupied areas have increased. The Umatilla River population has a high proportion of hatchery-origin fish spawning naturally representing a diversity risk. During the 5-year review of the Middle Columbia River Steelhead, the overall rating for the Umatilla/Walla Walla River populations remains at a "maintained" status. (NMFS, 2011)

Figure 1. Steelhead distribution within and adjacent to the Thomas Creek Restoration Project

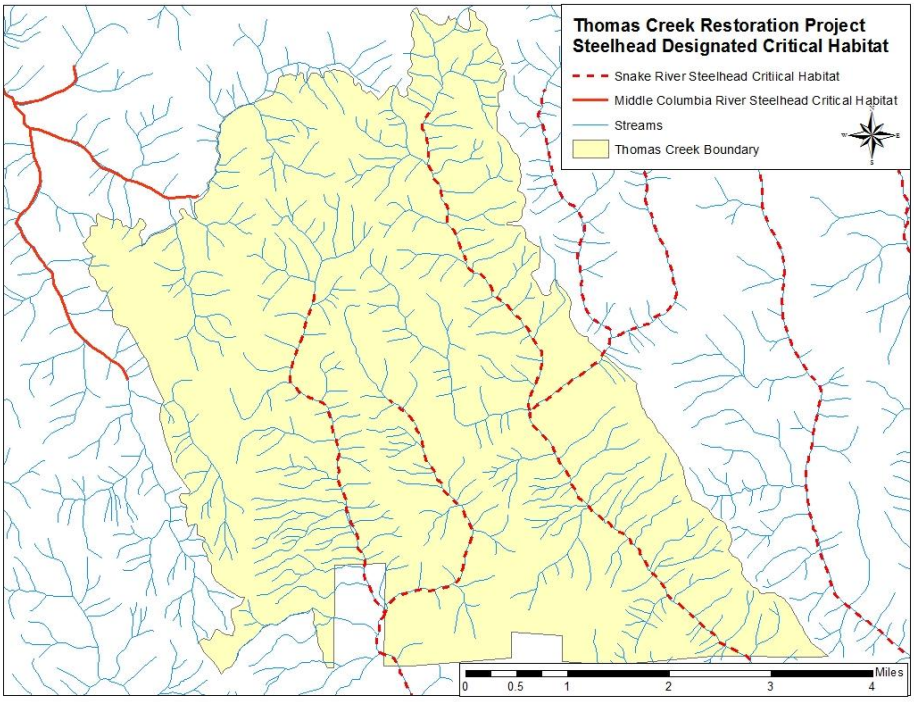


Designated critical habitat for Snake River Basin Steelhead includes all rivers and stream reaches accessible to steelhead below long-standing natural barriers (*Federal Register* Vol. 70 (52630); September 2, 2005). There are 13.9 miles of designated critical habitat for Snake River Basin steelhead within the project area. There is no designated critical habitat for Mid-Columbia River steelhead within the project boundary. The closest Mid-Columbia River steelhead designated critical habitat is approximately 0.7 miles from the closest harvest unit (unit 45). See Figure 2 for a map of Mid-Columbia River and Snake River Basin steelhead designated critical habitat located within and adjacent to the Thomas Creek project boundary. Table 6 reports the miles of designated critical habitat within the watersheds that encompass the Thomas Creek project area.

Table 6. Miles of steelhead designated critical habitat by watershed and within the project area

Designated Critical Habitat (DCH)	Watershed			Thomas Creek Project Area
	Headwaters Umatilla River	Cabin Creek – Grande Ronde River	Willow Creek	
Snake River Basin steelhead	-	81.9	49.8	13.9
Mid-Columbia River steelhead	67.2	-	-	-

Figure 2. Designated Steelhead Critical Habitat within and adjacent to the Thomas Creek Restoration Project



Snake River Spring Chinook salmon and their Designated Critical Habitat

Chinook salmon are anadromous, living part of their life in salt water while breeding in fresh water; and semelparous, reproducing only once in a lifetime. Biologists recognize different seasonal (i.e., spring, summer, fall, or winter) "races" or "runs" in the Chinook salmon migration from the ocean to fresh water.

Spring/summer-run Chinook salmon from the Snake River basin exhibit stream-type life history characteristics. The spring-run Chinook salmon return to the Columbia River from the ocean in early spring and pass Bonneville Dam beginning in early March and ending the first week of June. The summer-run Chinook salmon return to the Columbia River from June through August. Returning fish hold in deep mainstem and tributary pools until late summer, when they emigrate up into tributary areas and spawn. In general, Snake River Basin spring-run Chinook salmon tend to spawn in higher-elevation reaches of major Snake River tributaries in mid- through late August. Snake River Basin summer-run Chinook salmon spawn approximately one month later than spring-run fish and tend to spawn lower in the Snake River Basin drainages, although their spawning areas often overlap with spring-run spawners.

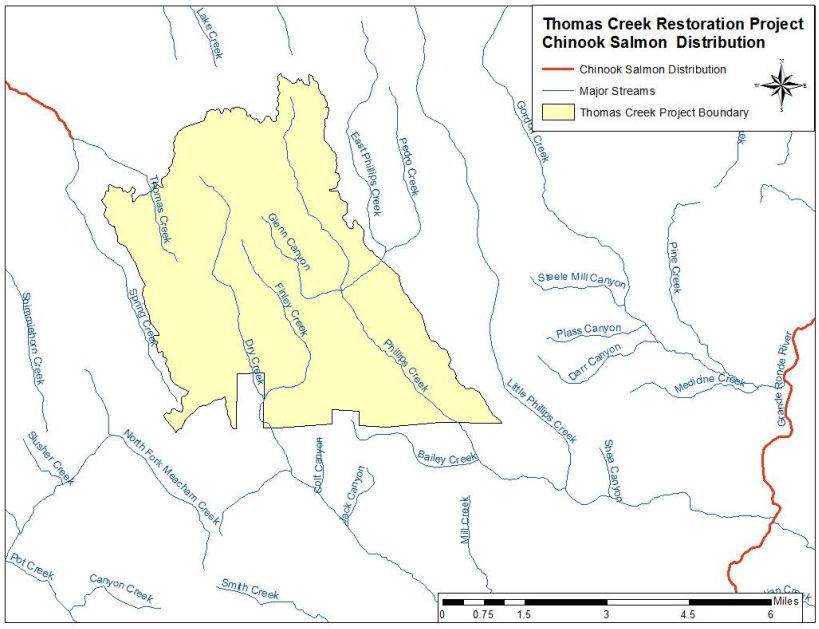
The stream-type life history may be adapted to select spawning and rearing areas that are consistently productive with limited susceptibility to dramatic changes in water flow. The eggs that Snake River spring and summer Chinook salmon deposit in late summer and early fall incubate over the following winter, and hatch in late winter and early spring of the following

year. Juveniles rear through the summer, overwinter, and typically migrate to sea in the spring of their second year of life, although some juveniles may spend an additional year in fresh water. Depending on the tributary and the specific habitat conditions, juveniles may migrate extensively from natal reaches into alternative summer-rearing or overwintering areas. Most of the fish spend two or three years in the ocean before returning to tributary spawning grounds primarily as 4- and 5-year-old fish. A small fraction of the fish spend only one year in the ocean and return as 3-year-old "jacks," heavily predominated by males (Good et al. 2005).

The Snake River spring/summer Chinook salmon was listed as Threatened under the Endangered Species Act on April 22, 1992 (50 FR 37160). Critical habitat was designated for Snake River spring/summer Chinook salmon on December 28, 1993 (58 FR 68543) and revised October 25 of 1999 (64 FR 57399). NMFS determined in March 1998, that listing was not warranted for Middle Columbia River spring/summer Chinook salmon. These listings decisions were reaffirmed in 2005 (Good et al. 2005; 50 FR 37160).

Snake River spring/summer Chinook salmon are not found within the Thomas Creek project boundary. They can be found approximately 6.9 miles downstream of the project area in the Grande Ronde River (Figure 3). Designated critical habitat for the Snake River spring/summer Chinook salmon is not mapped but is described in narrative in the rule (64 FR 57399). Critical Habitat includes those waters that are accessible upstream of occupied habitat. Due to large segments of Dry Creek and Phillips Creek going dry during the summer months, Dry Creek, Finley Creek, Phillips Creek and East Phillips Creek will not be considered Designated Critical Habitat. For more information on those streams see the Physical Barriers section of this report on page 26.

Figure 3. Chinook salmon distribution adjacent to the Thomas Creek Restoration Project



Essential Fish Habitat

The federal Magnuson-Stevens Act (MSA) requires analysis for effects to Essential Fish Habitat (EFH) specifically for Pacific salmon. Amendment 18, of the Pacific salmon Fisheries Management Plan, revises the description and identification of EFH for Pacific salmon managed under the FMP. Freshwater EFH, identified in Amendment 18 of the FMP, is described using fourth field hydrologic unit codes.

EFH includes all streams, lakes, ponds, wetlands, and other currently viable water bodies and most of the currently and historically accessible habitat to Pacific salmon species. The riparian zone adjacent to these waterways is also considered EFH. This zone is defined as shade, sediment, nutrient/chemical regulation, streambank stability, and LWD/organic matter.

The Thomas Creek project area falls within two HUCs (Upper Grande Ronde River and Umatilla) identified in the Pacific salmon Fisheries Management Plan as **EFH.** The project area includes essential fish habitat (EFH) for salmon.

The Upper Grande Ronde River HUC contains 885.3 miles of EFH and is associated with the Snake River spring Chinook ESU. The closest occupied EFH within the Upper Grande Ronde River HUC is the Grande Ronde River, approximately 6.9 miles downstream of the Thomas Creek project boundary and 9.8 miles downstream from the closest harvest unit. Phillips Creek, and Dry Creek flow into the Grande Ronde River but are inaccessible to salmon during the spawning season due to large segments of dry stream channel in their lower reaches.
The Umatilla HUC contains 425.1 miles of EFH and is associated with the Mid-Columbia River spring Chinook ESU. Mid-Columbia Spring Chinook have been found in Thomas Creek approximately 1.8 miles downstream of the project boundary and 3.3 miles away from the closest harvest unit. EFH will not be discussed any further due to the distance ~~from~~ between the Project Area and occupied EFH.

Comment [HHA-3]: ? Confused, does it?

Comment [DWM-4]: Based on the new definition it does. However it is unoccupied by salmon and inaccessable due to dry stream channel.

Comment [HHA-5]: It does or it doesn't?

Comment [DWM-6]: hopefully my previous comment makes it clear as mud. let me know if it doesn't.

Bull trout and their critical habitat

Bull trout (Salvelinus confluentus) are members of the Salmonidae family. They are often referred to as char, which is the common name for members of the genus *Salvelinus*.

In general, bull trout are a cold water species that inhabits Pacific slope drainages from northern California through British Columbia to extreme southeastern Alaska (Meehan and Bjornn 1991). Natural climactic warming and loss of cold water habitats since the Pleistocene period exacerbated by effects of human activities have reduced their distribution (Cavender 1978).

There are **no Bull trout** or their designated critical habitat within the Thomas Creek project boundary. Bull trout have been found in Thomas Creek, approximately 1.7 miles downstream of the project area, during biotic surveys. The closest designated critical habitats are on the Grande Ronde River (~6.9 miles downstream of the project area) and the Umatilla River (~7.4 miles downstream of the project area)

GIS databases show Bull trout are known to occur in 17.5 miles of streams in the Cabin Creek – Grande Ronde watershed and 37.7 miles of streams in the Headwaters Umatilla River watershed. Designated Critical Habitat for bull trout can be found in 17.5 miles of streams in the Cabin Creek – Grande Ronde watershed and 25 miles of streams in the Headwaters Umatilla River

watershed. There are **no Bull trout** or their designated critical habitat within the Thomas Creek project boundary.

Redband/Rainbow Trout

Interior Columbia Basin redband trout are a resident subspecies of Oncorhynchus mykiss found east of the Cascade Mountains in Oregon and Washington, in northern California, and in eastern British Columbia. Behnke (1979) noted two main evolutionary lines of the species dating back to the Pleistocene; the coastal rainbow trout west of the Cascades and the inland Columbia Basin redband trout east of the Cascades. Both of these evolutionary lines include steelhead populations of their respective areas. They are currently recognized as being two separate subspecies, with the natural break between them being the Cascades Mountains in Oregon.

Hatchery rainbow trout stocked for sport fisheries are typically produced from the coastal subspecies *(Oncorhynchus mykiss irideus*), and had been stocked in analysis area waters in earlier decades, but hatchery stocking in free-flowing streams of the Umatilla and Upper Grande Ronde subbasins has been discontinued in recent years. Absent genetic analyses to show dominant hatchery genetics, all resident O. mykiss in the analysis area are presumed to be *O. mykiss gairdneri*/interior Columbia Basin redband trout, particularly since the two subspecies display different patterns of coloration. Genetically pure populations of redband can generally be found isolated above migratory barriers where stocking has not occurred (Behnke 1979).

Redband trout require stream and riparian habitat conditions in the area favorable to spawning and rearing. Factors concerning their habitats include water temperature, water quality, timing and quantity of peak stream flows, and physical in-stream and riparian habitat characteristics. Good water quality is essential for spawning and rearing. Redband require similar in-stream habitat characteristics as other cool-water salmonids. A variety of habitat types are important in providing adequate habitats for all life stages.

GIS data from Oregon Department of Fish and Wildlife (ODFW) show Redband/rainbow trout are present in 14.2 miles of streams within the Thomas Creek project boundary.

Regional Sensitive Invertebrate and Vertebrate Species

A number of sensitive invertebrate and aquatic vertebrate species are known or suspected on the Umatilla National Forest. Table 8 describes their known or suspected presence in the analysis area.

Table 7. Regional Forester's List of Sensitive Aquatic Invertebrate and Vertebrate Species Present or suspected on the Umatilla NF

Regional Sensitive Aquatic Species	Habitat Description*	Habitat Present in Analysis Area	Species Present in Analysis Area	Known Current Distribution

Western Ridged Mussel *(Gonidea angulata)*	Occur in streams of all sizes of low to mid-elevation watersheds. Common in stable stream reaches, tolerant of fine sediments and occupy depositional areas.	Habitat likely present in upper Dry Creek, East Phillips Creek, Phillips Creek. Lower reaches of the above creeks dry up during the summer months. Habitat is present in the Headwaters Umatilla Watershed.	Assumed present within the analysis area although none have been found during stream surveys or project field visits. Individuals were found in Thomas Creek downstream of project area.	Widely distributed west of the Continental Divide, CA to BC. It is mainly distributed east of the Cascades.
Shortface Lanx (*Fisherola nuttalli*)	Occurs in large low to mid-elevation riverine habitats. Common in unpolluted, cold, well oxygenated, perennial streams with cobble-boulder substrate.	Present in Umatilla River and tributaries.	Present in Umatilla River and tributaries.	Found throughout the Snake River and the Mid-Columbia basin limited to large rivers: the Upper and Lower Deschutes, Lower John Day, Upper Columbia (Okanagan R.); Umatilla River and tributaries
Westslope Cutthroat Trout *(Oncorhynchus clarkii lewisi)*	Cold clear, water, high mountain streams with variable habitat complexity	No	No, the project area is outside the historic, known current and suspected spatial range of the species	Found throughout the Mid-Columbia River Basin, NFJD and Upper John Day R. subbasins

*Frest and Johannes 1995, Nedeau et al. 2009, Neitzel and Frest 1990, NatureServe Explorer 2009, Paulson 1999, Scheuering 2006, forest stream survey data (on file); Xerces.org database.

Westslope cutthroat trout

Westslope cutthroat are considered a sensitive species on the Forest. The only known or suspected populations are located in high-elevation watersheds of the John Day River basin. There are no Westslope cutthroat trout located in the Thomas Creek project area and will not be discussed any further in this Fisheries Specialist Report.

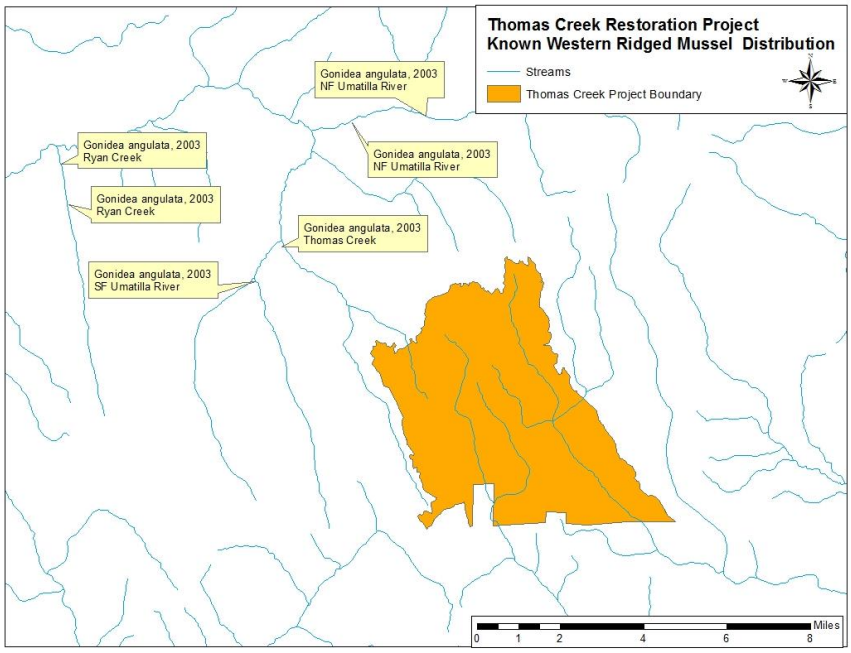
Western Ridged mussel

Western Ridged mussels (*G. angulate*) are filter feeders that consume phytoplankton and zooplankton suspended in the water. *Gonidea angulata* is a relatively slow growing and long lived species – perhaps living 20 to 30 years (COSEWIC 2003, Vannote and Minshall 1982). To reproduce, adult females release fertilized juvenile mussels, or glochidia, in packets called

conglutinates. Glochidia attach to host fish for a period of weeks to months. Once glochidia are released, they attach to a fish host. In northern California, the release of glochidia apparently peaks in June, and the glochidia are probably excysted from fish primarily during the period from late June to late July (Spring Rivers 2007).

Gonidea angulata is known to occur in the North Fork and South Fork Umatilla River and Birch, East Birch, Butter, North Fork Butter, McKay, Ryan, Squaw, Thomas, and Wildhorse Creeks in Umatilla County and in Blitzen and Grande Ronde Rivers in Union County (Xerces Freshwater Mussel database 2009). Those found in Thomas Creek are located approximately 1.7 miles downstream of the Thomas Creek Project boundary. It is unknown if they occur elsewhere within the project area. Figure 4 is a map of the current known locations of the Western ridged mussel. Stream surveys conducted in 2013 and 2015 did not mention finding any during the survey. The surveys did report large segments of stream being dry at the time of the surveys. See the discussion on physical barriers on page 26 for more information on the dry channels found during the surveys.

Figure 4. Western ridged mussel locations adjacent to the Thomas Creek Restoration Project



Shortface Lanx

Fisherola nuttalli is generally restricted to relatively large perennial streams ranging from 30-100 m (98-300 ft.) wide in the Columbia River Basin. Within such streams it is found primarily at the edges of rapids or immediately downstream from rapids in areas that have suitable substrate. This species requires clean, cold, well-oxygenated water with gravel, cobble, and boulder substrate. In an assessment

of Hells Canyon Dam (Snake River, Idaho), *F. nuttalli* was found on cobbles in higher velocity areas of the stream much more frequently than any other mollusk species; this was considered to reflect the species' preference to attach themselves to hard surfaces in high velocities to avoid competition with other species (Richards *et al*. 2005). *Fisherola nuttalli* has not been found in areas with the following characteristics: slow flow; silt or mud substrates; extreme seasonal variations in discharge; an abundance of macrophytes (aquatic plants) or epiphytic algae; a bedrock substrate; or where dredging or mining occurs (Neitzel & Frest 1992; Frest & Johannes 1995; Frest 1999; Richards *et al.* 2005). The snails feed by scraping algae and diatoms from the surface of rocks and boulders.

Freshwater pulmonate snails generally reproduce sexually, laying their eggs from spring to fall in a gelatinous capsule attached to plants or stones. Egg capsules of *F. nuttalli* are usually laid on the undersides or sides of cobbles in protected areas where adults occur. *Fisherola* are hermaphrodites but do not appear to be self-fertilized, i.e. mating occurs between two individuals. Hatchlings are morphologically similar to adults, except that they lack a functional reproductive system. Young snails appear to grow rapidly and require only a few months to reach full size. Individual *F. nuttalli* generally live for only one year, as this species breeds once and dies afterwards (semelparous breeding) (comments by T. Frest in 5-year review and evaluation of Banbury Springs limpet, U.S. Fish and Wildlife Service 2006). Individuals are present year-round in the streams they inhabit, but are inactive during the winter. Dispersal of *F. nuttalli* occurs as snails crawl slowly across the substrate or are carried by the current.

DISTRIBUTION

Fisherola nuttalli was historically widespread, with populations scattered throughout the lower Columbia and Snake Rivers as well as some of their major tributaries, and was known from Washington, Oregon, Idaho, and Montana. It has also been documented in the Columbia River drainage in British Columbia, Canada, although its presence there was assumed based on the discovery of a shell (Clarke 1981). Prior to 1987, collections of *F. nuttalli* are reported from Columbia and Spokane Rivers in Washington; the Snake and Salmon Rivers in Idaho; the Deschutes River in Oregon; and the Kootenai River in British Columbia. Columbia River sites extended from Portland, Oregon, to the Hanford Reach in Washington. Most of these sites no longer have suitable *F. nuttalli* habitat due to the effects of damming, impoundment, pollution, and water withdrawals for irrigation (Neitzel & Frest 1992), although one occurrence is known in Oregon near the Bonneville Dam. This species is now presumed extirpated in Montana and British Columbia, although it may persist in the Okanogan River drainage in British Columbia (Stagliano *et al*. 2007).

Currently, large populations of *F. nuttalli* persist in only four streams: the lower Deschutes River, Oregon; the Okanogan River and the Hanford Reach of the Columbia River, Washington; and the Snake River in Oregon and Idaho. Additional small populations are found in Oregon in the John Day and Imnaha Rivers, and the lower Columbia River near Bonneville Dam; the Methow River, Washington; and the Grande Ronde River, Washington and Oregon (Neitzel & Frest 1992; Frest & Johannes 1995, 2000; Frest 1999; Richards *et al*. 2005; Idaho Conservation Data Center 2006). Many of these areas are on federal lands, including the Hanford Reach (Department of Energy); Deschutes Wild and Scenic River; Hells Canyon National Recreation Area; Okanogan, Gifford Pinchot, and Mt. Hood National Forests; and the Bonneville Power Administration.

Freshwater limpets, presumed to be Shortface Lanx, were found near the Umatilla Forest boundary in Ryan Creek and the Umatilla River (Brimbox, 2003). Ryan Creek is located in the

Ryan Creek subwatershed of the Headwaters Umatilla River watershed. They are not known to occur within or adjacent to the Thomas Creek Project area.

Existing Condition

Methodology and Assumptions

For this document, the environmental baseline discussion and discussion of effects use FS habitat stream survey data and ODFW stream survey data as well as GIS analysis and the Interior Columbia Basin Ecosystem Management Project (ICBEMP) summary values (McKinney et al. 1996, see table 11) as directed under ICBEMP memorandum FS agreement No. 03-RMU-11046000-007, and reports in published scientific literature. Water temperature data is referenced from the Umatilla National Forest monitoring records. The seven-day moving maximum and average summer time water temperatures are measured. Stream surveys follow the Region 6 Level II stream survey protocol (following a modified Hankin and Reeves 1988 protocol). The surveys were conducted to document stream conditions and establish a baseline. Surveys have been completed and updated for most major streams in the Project Area. Data for Phillips Creek and East Phillips Creek came from stream surveys conducted in 1994. New stream surveys are currently being conducted and values will be updated before the final EA. See Table 8 for a list of completed stream surveys and the year they were surveyed.

Table 8. Hankin-Reeves Stream Surveys for the Thomas Creek Project Area

STREAM NAME	SURVEY YEAR	ROSGEN STREAM TYPE
Spring Creek	1992, 2013	(Reach 1 and 2) B3a
Thomas Creek	1992, 2013	(Reach 1) F2b/F3b
Dry Creek	1992, 2000	(Reach 1 and 2) B4a
Phillips Creek	1994, 2015	(Reach 2) C3/B3; (Reach 3) B4a
East Phillips Creek	1994, 2015	(Reach 1) B4

The Thomas Creek Restoration Project proposes timber harvest, commercial thinning, non-commercial thinning, mechanical fuel treatments, prescribed burning, road use, construction, and maintenance, and stream restoration. Each of these activities carries potential for effects to some component of aquatic habitat. Water quality, habitat quality, and the ability of the watershed and riparian areas to act as a buffer to timber management activity and its connected actions are components of aquatic habitat considered in this analysis. Pool frequency and quality, large woody debris (LWD), width/depth ratios, and water temperature are habitat components that are potentially affected by timber and fuel treatment activities.

These habitat parameters are specifically addressed as PACFISH Riparian Management Objectives (RMO's) (referencing Section 7 Fish Habitat Monitoring Protocol for the Upper Columbia River Basin, USDA Forest Service, 1994), and are summarized in Table 9. These objectives are metrics used to assess the complexity of habitat available for fish within the analysis area. The RMO values may not occur in a specific stream segment within a watershed, but all generally should occur at the watershed scale for stream systems of moderate to large size (3^{rd} to 7^{th} order) (PACFISH EA, Appendix C-5).

Table 9. PACFISH RMOs (UNF LRMP as amended by PACFISH, 1995)

Habitat Feature	RMO's
Pool Frquency Wetted Width (ft) Number of pools/mile	 10 20 25 50 75 100 125 150 200 96 56 47 26 23 18 14 12 9
Water Temperature	No measurable increase in maximum water temperature. * Maximum water temperatures < 68^{o}F within migration, < 55.4^{o}F within Salmon/Steelhead spawning and rearing habitats and < 53.6^{o}F within Bulltrout spawning and rearing habitats.
Large Woody Debris	East of the Cascades in Oregon and Washington > 20 pieces/mile, >12 inch diameter, >35 ft. length
Bank Stability	>80 percent stable
Width/Depth Ratio	<10, mean wetted width divided by mean depth

Under the Section 7 Habitat Monitoring Protocol for the Upper Columbia River Basin (USDA 1994), PACFISH RMO's are intended to apply to fish bearing Rosgen (1996) C-type channels and are meant to describe good fish habitat. Table 9, above, has a list of streams and their associated Rosgen stream channel type. These types of channels are most commonly found in low-gradient channels in wide alluvial valley bottoms. For example, monitoring protocol for determining pool frequency requires count of only pools greater than 1 meter (~3 feet) deep in low gradient (1% -2%) stream channels.

Streams within or adjacent to the analysis area that do not fit these criteria include Spring Creek, Thomas Creek, Dry Creek , East Phillips Creek and Reach 3 of Phillips Creek. These Streams are more representative of a Rosgen Type B stream channel. Because of this, ICBEMP pool frequencies are more applicable to these streams than the PACFISH standard. ICBEMP pool frequency values are more representative of stream capabilities within the analysis area. Reach 2 of Phillips Creek was classified as a B/C type channel and therefore would be expected to meet the RMOs.

Table 10. Calculated ICBEMP pool frequency values (McKinney et al. 1996)

Wetted Width (ft.)	Pools/mile**
0-5*	39*
5-10	20
10-15	12
15-20	8.4
20-30	5.9
30-35	4.5
35-40	3.9
40-65	2.8
65-100	1.8

*Streams less than 5 feet wide, reaches would be expected to have a lower density of pools; however, there is no available way to calculate an appropriate value so standard would defer to the value of 39 pools per miles selected by the USFWS.

**To calculate the standard pools/mile using ICBEMP value of 0.028 for specific widths 147.8/channel width = standard pools/mile.

Habitat Elements:

Additional habitat parameters that are important for determining complex aquatic habitat and considered in this analysis include substrate embeddedness/percent fines, habitat accessibility, off channel habitat and refugia, floodplain connectivity, streambank condition, road density and location (measured as mi/mi^2 and percent drainage network increase), and past disturbance to riparian conservation areas.

Pool Frequency and Quality

Pool quality and quantity was only summarized for those streams surveyed (Table 11). There are few pieces of LWD that create pool habitat, however, there is potential for additional LWD recruitment.

Table 11. Pool frequency in streams surveyed

Stream/Reach	Surveyed pools/mile	PACFISH standard pool/mile	ICBEMP pool frequency	Residual pool depth (ft)
Dry Creek - R1	2	96	39	1.30
Dry Creek – R2	13	96	20	1.10
Spring Creek - R1	51	96	20	1.16
Spring Creek - R2	44	96	20	1.01
Thomas Creek- R1	42	96	12	2.45
East Phillips Creek – R1	48	96	20	1.11
Phillips Creek – R2	35	96	20	1.51
Phillips Creek – R3	34	96	39	0.78

Substrate Embeddedness

Cobble embeddedness is the degree to which larger particles (boulder, cobble, and gravel) are surrounded or covered by fine sediment. Substrate was considered embedded in the Umatilla/Meacham Ecosystem Assessment, if > 35% coverage of larger particles by fine sediments, based on visual assessment. Crabtree (1996) did not define fine sediments in terms of particle size, but they are assumed to be sand-sized particles or smaller than 2 mm, as these are the sizes most likely to occupy the substrate interstitial spaces needed for hiding cover and spawning gravel oxygenation. Substrate embeddedness is a highly subjective measurement and especially difficult to estimate in most of these stream reaches given the gradient, flow, geology and existing riparian condition of the majority of stream reaches in the analysis area. Embeddness data have not been collected in the project area

According to the NMFS/USFWS matrix of pathways and indicators, if embeddedness data are not available, an alternate way to address this concern is to determine the degree to which cobbles and gravels are the dominant portion of streambed substrate composition and whether interstitial spaces are relatively clear.

Wolman pebble counts were used to characterize substrate composition and percent fines throughout the bankfull streambed. The Wolman pebble count protocol assesses substrate distribution between the bankfull margins of the stream, including outer margins of the streambed that are dry at low flow. Outer margins of the bankfull channel tend to contain more fines than low-flow the wetted channel; therefore, these bankfull to bankfull measurements may overestimate the percent surface fines in the low-flow wetted channel.

Wolman pebble counts were conducted as part of the stream surveys in the project area and were used to calculate percent fines in term of substrate composition. Streams are considered to provide good fish habitat conditions when fines comprise less than 12% of the streambed substrate and cobbles and gravels comprise the majority of the streambed with clear interstitial interspaces. Substrate compositions in the surveyed stream reaches within the analysis area are dominated by gravels and cobbles. Only Dry Creek Reach 1 contains levels of fine sediment marginally high enough to warrant slight concern. The low levels of fines in the substrate composition in the other stream reaches, together with a dominance of gravels and cobbles, support the conclusion that embeddedness is low in the project area streams and that the majority provide good spawning habitat. Table 12 shows the percentage of each substrate category that was found in each stream survey reach.

Table 12. Substrate percentages based Wolman pebble counts

Stream/Reach	Clay, Silt & Sand %	Gravel %	Cobble %	Boulder %	Bedrock %
Dry Creek - R1	13	63	22	2	0
Dry Creek – R2	11	58	28	3	0
Spring Creek - R1	4	37	36	23	0
Spring Creek - R2	7	51	35	7	0
Thomas Creek- R1	0	20	40	40	0
East Phillips Creek - R1	7	37	46	10	0
Phillips Creek –R2	8	30	60	2	0
Phillips Creek – R3	13	38	47	2	0

Large Woody Debris (LWD)

The Pedro-Colt Fisheries Report (USFS 2001) summarized stream conditions in Dry, Phillips and East Phillips Creeks. Crabtree (USFS 2001) found that about 3 miles of previous harvest units along Phillips Creek are lacking in large wood and habitat complexity. Large woody debris information was collected during recent stream surveys and is summarized in Table 13. Of the reaches surveyed, 3 out of 8 meet PACFISH RMO's for LWD. Action alternatives of this project may provide opportunity for future large wood recruitment through prescribed fire treatments within RHCA's as well as placing wood directly into Phillips Creek.

Table 13. Stream Survey Reaches and LWD/mile

Stream Survey Reach	LWD / mile	PACFISH RMO
Dry Creek - R1	25	> 20 pieces/mile, >12 inch diameter, >35 ft. length
Dry Creek – R2	19	
Spring Creek - R1	25	
Spring Creek - R2	22	
Thomas Creek- R1	18	
East Phillips Creek – R1	5	
Phillips Creek – R2	9	
Phillips Creek – R3	12	

Water Quality:

Stream Temperature

Table 15 summarizes continuous recording thermograph data collected within and downstream of the project area. Data indicate that East Phillips Creek has exceeded the standard in 2006 and 2007 and Spring Creek did not meet the bull trout temperature criteria.

Table 14. Continuous recording thermograph data summary (7-day average maximum)

Watershed	Stream	Location	Years	Range (°F)	Source
Cabin Creek – Grande Ronde River	Phillips Creek	FS boundary	2004-2014	58 - 63	FS
		Upper and Lower	1993	55	ODFW
		Upper 2 miles (6 sites)	1993	52 - 59	ODF
	East Phillips Creek	Above mouth	1986, 1988, 2006-2013	56 - 65	FS
		Upper	1993	54 - 57	ODF
Headwaters Umatilla River	Thomas Creek	At mouth	2006	66	PIBO
	Spring Creek	At mouth	1992-2004	62 - 67	FS

Instantaneous 'grab' temperatures have also been collected from streams within and downstream of the project area. Temperatures in Spring Creek ranged from 50 – 58 °F (40 samples) during the August 2013 stream survey (USFS 2013a). Temperatures in Thomas Creek ranged from 52 – 63 °F (23 samples) during the August 2013 stream survey (USFS 2013b). Table 16 summarizes data collected during field reconnaissance in 2014. Phillips Creek is characterized by discontinuous flow during the summer. The 2015 stream survey reported about 25% of the lower 4.2 miles had surface flow and about 56% of the upper 4.5 miles had surface flow. East Phillips Creek maintains perennial flow. Dry Creek is an intermittent stream, with about one mile of surface flow. Finley Creek is an intermittent stream and was flowing a couple hundred feet from its mouth, then dry to the headwaters. Thomas Creek flowed perennial below the confluence with Spring Creek and had isolated wetted segments upstream along FR32 and perennial flow in several headwater tributaries. Spring Creek maintains perennial flow, but the tributary in the project area has a discontinuous flow regime.

Table 15. Instantaneous water temperature data summary - 2014

Watershed	Stream	Location	Date	Range (°F)	Source
Cabin Creek-Grande Ronde River	Phillips Creek	3 sites	8/20/14	54 - 59	FS
	East Phillips Creek	Above FR 3480 culvert	8/20/14	59	FS
Willow Creek	Dry Creek	6 sites	Aug, 2014	50 – 59	FS
	Finley Creek	Above FR 32 culvert	8/06/14	59	FS
Headwaters Umatilla River	Thomas Creek	3 sites	8/01/14	55 – 59	FS
	Spring Creek	At mouth	8/01/14	59	FS

Sediment

Fine sediment is detrimental to aquatic life through in-filling salmon and trout spawning gravels and water column abrasiveness and opacity.

Sources of sediment include hillslope and channel erosion and the road network. Sediment mobilized from hillslopes and roads may be stored in channels for years or delivered into a stream within a season depending on precipitation patterns. Monitoring sedimentation downstream in the Umatilla River and North and South Forks indicated that much of the annual sedimentation

was generated from only a few, large runoff events (Harris and Clifton 1999). Sediment transport during spring snowmelt was the dominant transport process, although rain-on-snow events produced some of the largest single event volumes.

Roads have the potential to intercept surface and subsurface water, reducing infiltration and speeding the delivery of water to channels. Sedimentation may be increased by surface erosion from roads and the ability of road drainage to route sediment to channels.

The major system roads up Thomas Creek (FR32), Dry Creek (FR32) and Phillips Creek (FR3738) are located parallel to the stream channels. Due to the narrow valley bottom and orientation, the roads reduce shade and increase sedimentation. For more information on sediment see the Soils and Hydrology reports.

Bank Stability

The stream surveys, within and adjacent to the project area, collected information on stream bank stability. Table 17 summarizes the percentages of stable stream bank for surveyed streams. The Phillips Creek, East Phillips Creek and Dry Creek stream reaches are within the project boundary. Thomas Creek and Spring Creek reaches are adjacent to the project boundary.

Table 16. Percentage of stable stream banks found during stream surveys

Stream	Percent Stable Stream Bank	Year Surveyed
Phillips Creek (Reach 2)	94	2015
Phillips Creek (Reach 3)	99	2015
East Phillips Creek (Reach 1)	99	2015
Dry Creek (Reach 1)	100	2013
Dry Creek (Reach 2)	100	2013
Thomas Creek (Reach 1)	100	2013
Spring Creek (Reach 1)	100	2013
Spring Creek (Reach 2)	99	2013

Habitat Access:

Physical Barriers

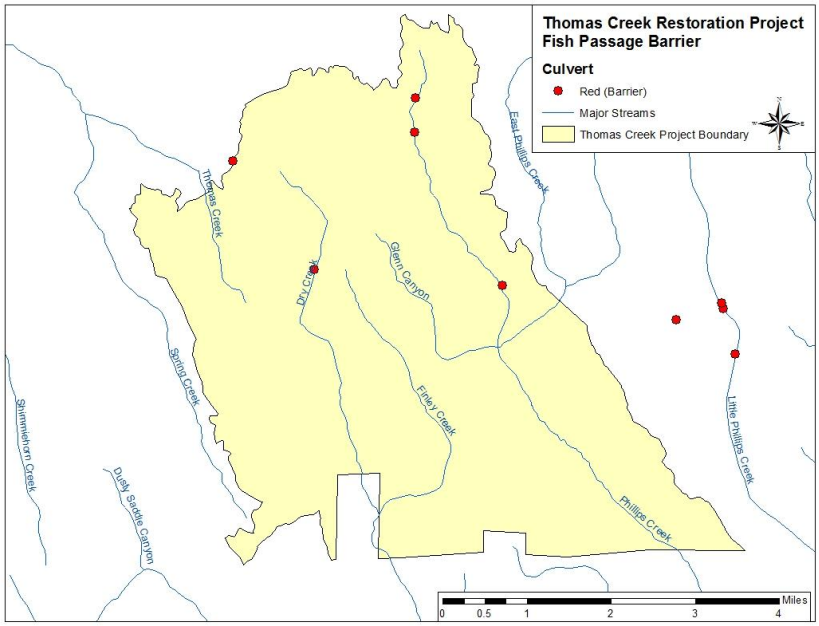
Access to habitat is being limited by segments of stream that go dry during the summer months and culverts. Phillips Creek stream surveys conducted in 1994 noted that reach 2, from the Forest boundary upstream to East Phillips Creek, was about 30% dry and reach 3, from East Phillips Creek upstream 4.1 miles, was about 60% dry. Stream surveys, conducted during 2015, found those same reaches were dry 27% and 57% respectively. Stream surveys conducted in 2000 on Dry Creek noted that 94% of Reach 1 and 39% of Reach 2 had dry channel.

The Umatilla Forest culvert GIS layer identified five culverts as not meeting regional aquatic passage criteria. Below, Table 18 provides the Forest Road number, stream name and the culvert ID of culverts identified as fish passage barriers within the Thomas Creek project area. Figure 5 shows the location of the culverts within the Thomas Creek project area.

Table 17. Culverts Identified as Fish Passage Barriers within the Project Area

Forest Road	Culvert ID	Stream Name	Miles of class 1 or 2 stream above culvert
3738	34	Phillips Creek	3.05
3738-090	35	Phillips Creek	0.81
3738	36	Phillips Creek	0.38
3200	37	Dry Creek	0.58
3200	63	Thomas Creek	0.00

Figure 5. Fish passage barrier culverts within Thomas Creek Restoration Project



Channel Conditions & Dynamics:

Width/Depth Ratio

Interim RMOs (see Table 10) were established as a baseline guide for describing good habitat for anadromous fish for 3rd to 7th order streams at the watershed (HUC5) scale. Data are summarized in Table 19 as a requirement to show compliance with interim RMO metrics. Width to depth ratio was calculated for those streams surveyed during 2013 and 2015. The ratios calculated are average wetted width to depth ratio in riffles (Table 18). The width/depth ratios for Dry Creek are not very accurate. The Dry Creek stream surveys were conducted during August 2000. Based on the stream survey data 97% of Reach 1 was dry channel and Reach 2 was 50% dry channel. Based on best available science, the bankfull width/depth ration of < 10 is not desirable for all stream types. The streams shown in Table 19 are all 3rd to 5th order channels.

Table 18. Average Wetted Width/Depth Ratio for streams

Stream/Reach	Average	PACFISH RMO

	W:D Ratio	
Dry Creek - R1	2.0[1]	<10, mean wetted width divided by mean depth
Dry Creek – R2	16.0[1]	
Spring Creek - R1	17.7	
Spring Creek - R2	14.5	
Thomas Creek- R1	33.1	
East Phillips Creek – R1	26.0	
Phillips Creek – R2	42.9[1]	
Phillips Creek – R3	30.1[1]	

1 Probably not very accurate due to extensive sections of creek with no surface water during stream survey.

Current status of PACFISH riparian management objectives for fish bearing streams in the analysis area are summarized in Table 19 below. A (+) indicates that a stream is meeting PACFISH objectives while a (-) indicates a stream is not meeting PACFISH RMOs. The specific stream reach data concerning these PACFISH habitat and watershed condition elements are located in the project file. Most recent stream survey data was used and RMOs values reflect an average of stream reaches sampled.

Table 19. Current status of PACFISH RMO's and trends for fish bearing streams in the analysis area

Stream	Reach	Temp.	RMO Pools/ mile	ICBEMP Pool/mile	Bank Stability	Width/Depth ratio	LWD/ mile
Dry Creek	R1	+	-	-	+	+	+
	R2	+	-	-	+	-	-
Thomas Creek	R1	-	-	+	+	-	-
Spring Creek	R1	-	-	+	+	-	+
	R2	-	-	+	+	-	+
Phillips Creek	R2	-	-	+	+	-	-
	R3	+	-	-	+	-	-
East Phillips Creek	R1	+	-	+	+	-	-

Management Direction

Desired Condition

Management objectives and standards and guidelines needed to achieve desired conditions are summarized below from PACFISH (USDI 1995) and the Umatilla National Forest Plan (USFS 1990). PACFISH amended the UNF Plan, however, only to the extent that it is more restrictive than Forest Plan criteria. Where direction contained in existing plans is more restrictive than PACFISH, the plan direction applies (PACFISH Q&As, May 24, 1995).

Information found in Appendix C of PACFISH (Riparian Goals and PACFISH Standards and Guidelines) applicable to the Thomas Creek Restoration Project are presented below. PACFISH Riparian Management Objectives (RMOs) can be found in Table 9. Standards and Guidelines from the Umatilla National Forest LRMP that are applicable to the Thomas Creek project can be found in Table 20.

Riparian Goals (PACFISH Page C-4)

The goals are to maintain or restore:

1. water quality to a degree that provides for stable and productive riparian and aquatic ecosystems;
2. stream channel integrity, channel processes, and the sediment regime including the elements of timing, volume, and character of sediment input and transport under which the riparian and aquatic ecosystems developed;
3. instream flows to support healthy riparian and aquatic habitats, the stability and effective function of stream channels, and the ability to route flood discharges;
4. natural timing and variability of the water table elevation in meadows and wetlands
5. diversity and. productivity of native and desired non-native plant communities in riparian zones;
6. riparian vegetation to:
    a) provide an amount and distribution of large woody debris characteristic of natural aquatic and riparian ecosystems;
    b) provide adequate summer and winter thermal regulation within the riparian and aquatic zones; and
    c) help achieve rates of surface erosion, bank erosion, and channel migration characteristic of those under which the communities developed.
7. riparian and aquatic habitats necessary to foster the unique genetic fish stocks that evolved within the specific geo-climatic region; and
8. habitat to support populations of well-distributed native and desired non-native plant, vertebrate, and invertebrate populations that contribute to the viability of riparian-dependent communities.

PACFISH Category Definitions

	Fish bearing	Permanently flowing Non-fish bearing	Ponds, lakes, reservoirs and wetlands >1 Ac	Seasonally flowing or intermittent streams, wetlands < 1 ac, landslides and landslide-prone areas
PACFISH Category	Category 1	Category 2	Category 3	Category 4
R-6 Stream Class/Legacy stream maps	Class I, II	Class III	NA	Class IV (intermittent streams)
PACFISH Widths	2 SP tree*	1 SP tree	1 SP tree	1 SP tree
PACFISH "Default"	or 300 ft.	or 150 ft.	or 150 ft.	or 100 ft.

*SP = Site Potential

PACFISH Standards and Guidelines

General Riparian Area Management, page C-17

RA-2 Trees may be felled in RHCAs when they pose a safety risk. Keep felled trees on site when needed to meet woody debris objectives.

RA-3 Apply herbicides, pesticides and other toxicants and other chemicals in a manner that does not retard or prevent attainment of RMOs and avoids adverse effects to listed anadromous fish.

RA-4 Prohibit storage of fuels and other toxicants within RHCAs. Prohibit refueling within RHCAs.

RA-5 Locate water drafting sites to avoid adverse effects to listed anadrmous fish and instream flows and in a manner that does not retard or prevent attainment of RMOs.

Timber Management, page C-10

TM – 1 Prohibit timber harvest, including fuelwood cutting, in Riparian Habitat Conservation Areas, except as described below. Do not include Riparian Habitat Conservation Areas in the land base used to determine the Allowable Sale Quantity, but any volume harvested can contribute to the timber sale program.

b. Apply silvicultural practices for Riparian Habitat Conservation Areas to acquire desired vegetation characteristics where needed to attain Riparian Management Objectives. Apply silvicultural practices in a manner that does not retard attainment of Riparian Management Objectives and that avoids adverse effects on listed anadromous fish.

Roads Management page, C-10-12

RF – 2 For each existing or planned road, meet the RMOs and avoid adverse effects on listed anadromous fish by:

d. avoiding sediment delivery to streams from the road surface

e. avoiding disruption of natural hydrologic flow paths

f. avoiding sidecasting of soils or snow. Sidecasting of road material is prohibited on road segments within or abutting RHCAs in watersheds containing designated critical habitat for listed anadromous fish.

RF-3 Determine the influence of each road on the RMOs. Meet RMOs and avoid adverse effects on listed anadromous fish by:

- reconstructing road and drainage features that do not meet design criteria or operation and maintenance standards, or that have been shown to be less effective than designed for controlling sediment delivery, or that retard attainment of RMOs, or do not protect designated critical habitat for listed anadromous fish from increased sedimentation.
- Prioritizing reconstruction based on the current and potential damage to listed anadromous fish and their designated critical habitat, the ecological value of the riparian resources affected and the feasibility of options such as helicopter logging and road relocation out of RHCAs
- Closing and stabilizing or obliterating roads not needed for future management activities. Prioritized these actions based on the current and potential damage to listed anadromous fish and their designated critical habitat and the ecological value of the riparian resources affected.

RF-5. Provide and maintain fish passage at all road crossings of existing and potential fish-bearing streams

Fire/Fuels Management, page C-15-16

FM-1 Design fuel treatment and fire suppression strategies, practices, and actions so as not to prevent attainment of Riparian Management Objectives, and to minimize disturbance of riparian ground cover and vegetation. Strategies should recognize the role of fire in ecosystem function and identify those instances where fire suppression or fuel management actions could perpetuate or be damaging to long-term ecosystem function, listed anadromous fish, or designated critical habitat.

FM-4 Design prescribed burn projects and prescriptions to contribute to the attainment of the Riparian Management Objectives.

GLOSSARY

Attain RMOs – Meet riparian management objectives for the given attributes. For habitats below the objective level, recovery will be initiated during the period the interim strategy is in place. For habitats at or better than the objective level, maintain at least the current condition. Actions that 'degrade' habitat conditions (as defined elsewhere) would be considered inconsistent with the concept of attaining RMOs.

Degrade – Measurably change an RMO feature in a way that:

- Further reduces habitat quality where existing conditions meet or are worse than objective values
- Reduces habitat quality where existing conditions are better than the objective values

Prevent Attainment of RMOs – Preclude attainment of habitat conditions that meet RMOs. Permanent or long-term modification of the physical/biological processes or conditions that determine the RMO features would be considered to prevent attainment of RMOs.

Retard Attainment of RMOs – Measurably slow recovery of any identified RMO feature (e.g. pool frequency, water temperature, etc.) that is worse than the objective level. Degradation of the physical/biological process or conditions that determine RMO features would also be considered to retard attainment of RMOs.

UMATILLA NATIONAL FOREST LRMP Standards and Guidelines

Table 1920. Umatilla National Forest LRMP Standards and Guidelines

RIPARIAN/FISH HABITAT - FOREST-WIDE STANDARDS AND GUIDELINES	
Wetlands and Floodplains	• Meet the direction and processes for management of wetlands and floodplains in accordance with E.O. 11990 and E.O. 11998 and FSM 2527.
Best Management Practices	• Implement BMPs to meet water quality standards and protect streams and adjacent areas to maintain aquatic resources.
Class IV Streams	• Management activities will not deteriorate water quality below existing established water quality goals for downstream Class I and II streams; water quality changes in Class IV streams may involve some temperature and sediment increases • Woody vegetation and ground cover adjacent to stream channels will be managed to provide a continuous supply of in-channel large woody material to the stream in order to maintain or enhance streambank stability and to filter sediment generated on adjacent slopes. • Felling, skidding and road construction across the stream should be avoided. When streams cannot be reasonably avoided, activities should be conducted at times when streams are dry and at locations where streambank and stream channel disturbances are minimized. Skid trail crossings of intermittent stream channels will be predesignated. • Roads and trails shall be located, constructed and maintained so that the streambank and stream channel receive as little disturbance as possible. • Human-caused woody debris, < 6" in diameter and > 4' in length, that gets into the stream channel shall be carefully removed unless otherwise justified by environmental analysis. • Within riparian areas, ground-disturbing activities will be limited to the degree necessary to maintain and protect water quality and fish habitat. • Assess the potential for improving stream and riparian conditions, and where opportunities exist, improve intermittent streams to perennial flows. • Manage roads and trails to protect riparian wildlife values, fish habitat and water quality. Water quality and/or fish habitat problems caused by roads will be corrected.
Class III Streams	• Avoid felling timber across stream channels. • All logs shall be fully suspended over the stream or crossed on temporary structures. • Within the riparian areas, limit mineral soil exposure by ground-disturbing activities to 10% of the project area. • For Class I, II and III stream reaches which exceed desired maximum stream temperatures (State water quality standards), management activities within the surrounding contributing watershed shall not reduce stream surface shade below ecological potential

<table>
<tr><td></td><td>(EP). Where EP has not been determined for a reach, assumed EP shall be 80% stream surface shade.
• For Class I, II and III stream reaches which do not exceed desired maximum stream temperatures management activities within the surrounding contributing watershed shall not reduce stream surface shading more than 20% below EP in upstream reaches. Where EP has not been determined for a reach, assumed EP shall be 80% stream surface shade.
• Trees within one tree height of the stream channel will be managed to provide for a continuous supply of naturally occurring large woody material for future instream fish and riparian habitat in adjacent and downstream reaches.</td></tr>
<tr><td>Class I and II Streams</td><td>Management practices will not degrade water quality, fish, or aquatic resources below the water quality goals, except for temporary change due to permitted activities. The following practices are in addition to guidelines for Class III and IV streams:
• Streambanks should have 80% or more of their total lineal distance in a stable condition.
• Any increases in water temperature will be consistent with State standards.</td></tr>
<tr><td>Water</td><td>• Meet or exceed state water quality standards
• For all lands within national forest boundaries (including private inholdings), no more than 30% of the forest land within a subwatershed will have timber stand age classes of 0-10 years except where analysis documented in an environmental assessment indicates that watershed condition would not be impaired.
• Select, design, implement, enforce, monitor and adjust BMPs.</td></tr>
<tr><td>Soil</td><td>• Plan and conduct land management activities so that reductions of soil productivity potential causes by detrimental compaction, displacement, puddling and severe burning are minimized.
• Maintain a minimum of 80% of an activity area in a condition of acceptable productivity potential.
• Maintain minimum percent effective ground cover after cessation of any soil-disturbing activity as follows:
<table>
<tr><td rowspan="2">Erosion Hazard Class</td><td colspan="2">Minimum % Effective Ground Cover</td></tr>
<tr><td>1st Year</td><td>2nd Year</td></tr>
<tr><td>Low (very slight)</td><td>20-30</td><td>30-40</td></tr>
<tr><td>Medium (moderate)</td><td>30-45</td><td>40-60</td></tr>
<tr><td>High (severe)</td><td>45-60</td><td>60-75</td></tr>
<tr><td>Very High (very severe)</td><td>60-75</td><td>75-90</td></tr>
</table>
• Active slump and landslide areas will generally be considered to be unavailable for road construction.
• Along all perennial streams, adjacent floodplains and riparian areas take actions to prevent soil movement, including slumps, earth slides and other debris and material from moving downstream into higher class streams.
• In floodplains, riparian areas and aquatic habitats, ground-disturbing activities are limited to the degree necessary to minimize erosion and sedimentation.</td></tr>
<tr><td colspan="2">C5 – RIPARIAN – Standards and Guidelines</td></tr>
<tr><td>Fish</td><td>• Riparian vegetation will be managed to promote floodplain, bank and channel stability, to provide resiliency to disturbance and promote aquatic diversity.
• Where natural conditions permit, streamside vegetation along the entire length of perennial streams will be managed to maintain an average shading of 80% of the entire stream surface shaded. Where existing shading is already below this level, retain all vegetation contributing to stream surface shading.
• Lands and trees adjacent to perennial streams will be managed to provide for a continuous, well distributed supply of naturally occurring, large woody material for in-stream fish and riparian habitat. At a minimum, these lands will include a zone within one tree height of the stream channel.
• Streams will be managed to provide pools that are relatively large, frequent, well distributed and persistent during low flows.
• Forest-wide standards for temperature and in-stream flows will be met.</td></tr>
</table>

	The sediment budget will fall well within the range and frequency adapted to by indigenous aquatic communities.
Timber	• Created openings adjacent to live streams may be permitted, provided the stream surface shading, large woody material and water quality requirements for fisheries are met. If natural shading is below the 80% level, meet the Forest-wide standards and guidelines for riparian/fish habitat (Class III streams). Created openings should generally be 1 acres or smaller, but no larger than 2 acres in size. No more than 6% of the entire riparian area within a subwatershed will be created openings (trees < 10 feet in height) at any time.
Soil	Within 250 feet of all streams and wet areas associated with streams, limit the mineral soil exposed by ground-disturbing activities to 10% of the project area.
Transportation	• Construction, reconstruction and the maintenance of roads will be permitted when consistent with the riparian management goals. New roads should be located outside the riparian area (except for crossings) unless alternatives are determined to have higher adverse impacts to resources. Water quality and fisheries habitat problems caused by roads will be corrected.
Fuels/Rx Fire	• Fuels management activities will be designed and executed to maintain or enhance the anadramous fish and wildlife habitat within the constraints of 10% exposed mineral soils and 80% stream surface shading. • Fuels should not exceed an average of 9 tons per acre in the 0-3 inch size class and an average residue depth of 6 inches, as depicted in the Photo Series for Quantifying Forest Residues (Technique Report PNW 52): 3-PP4-PC, 4-PP-1-TH, 1-PP&ASSOC-4-PC, 2-LP-3-PC Prescribed fire may be used consistent with riparian objectives
TRANSPORTATION SYSTEM – Standards and Guidelines	
Road Closures	• Obliterate all roads not in the Forest Development System or authorized by permit, lease or easement. Obliterated roads will be revegetated to provide stabilization and to return the area to its intended use. Short term (temporary) roads will be obliterated.

Best Management Practices, Forest Plan Standards and Guides and Project Design Criteria

Appendix A of this report contains a combined list of Forest Plan Standards and Guides and Best Management Practices (BMP's) that were chosen to apply to the proposed action and action alternatives. This list also includes Thomas Creek Project design criteria that have been specifically developed for the Thomas Creek Proposed Action and action alternatives. The list displays whether or not a measure would be implemented under a contractual stipulation; if the measure is a Forest Plan Standard and Guide, or if it was developed based on those Forest Plan Standard and Guides; if the measure is taken from the National Best Management Practices for Water Quality Management on National Forest System Lands (2012); and how and if the measure was refined as a project design criteria specifically for the Thomas Creek Project. Unless otherwise stated, these measures apply to the proposed action and all action alternatives.

Environmental Consequences

Issues Addressed and Indicators for Assessing Effects

This section analyzes the direct and indirect effects of the proposed project on listed and non-listed native species, designated critical habitats and EFH. Direct effects are immediate impacts, both adverse and beneficial, from project-related actions. Indirect effects are caused by, or result from, the proposed action and may occur later in time. Table 22 is a list of indicators that will be used to assess the effects of the action alternatives for the proposed project.

Table 2021. Indicators for Assessing Effects for Fisheries

Objective	Indicator	Justification
Water Quality	Stream temperature	UNF and LRMP as ammended by PACFISH, 1995
Water Quality	Sedimentation	UNF and LRMP as ammended by PACFISH, 1995
In-stream Habitat	Large Woody Debris (LWD)	UNF and LRMP as ammended by PACFISH, 1995
In-stream Habitat	Pools per mile	UNF and LRMP as ammended by PACFISH, 1995
Channel Stability	Width/Depth Ratio	UNF and LRMP as ammended by PACFISH, 1995

Spatial and Temporal Context for Effects Analysis

Spatial Context

The geographical context for estimating direct effects is National Forest System (NFS) lands located within the Willow Creek Watershed, Cabin Creek-Grande Ronde River Watershed and Headwaters Umatilla River Watershed and directly affected by implementation of forest vegetation, in-stream restoration and fire/fuels management activities included in an alternative.

The geographical context for estimating indirect effects is NFS lands located within the Willow Creek Watershed, Cabin Creek-Grande Ronde River Watershed and Headwaters Umatilla River Watershed. Analysis of indirect effects considers the influence of direct effects occurring at a different time or place than the direct effects themselves.

The geographical context for estimating cumulative effects is the Willow Creek Watershed, Cabin Creek-Grande Ronde River Watershed and Headwaters Umatilla River Watershed. There is no need to extend the cumulative effects analysis area beyond those watersheds.

Temporal Context

The temporal context for evaluating environmental effects considers past, present, and reasonably foreseeable actions in the Thomas Creek Restoration planning area, as described below.

Past, Present, and Foreseeable Activities Relevant to Cumulative Effects Analysis

Cumulative impacts result from the incremental impact of the action **when added** to other past, present and reasonably foreseeable future actions. If there are no direct or indirect effects of the proposed action, there cannot be cumulative effects.

Past Actions

Past actions in the analysis area include grazing, fires, fire exclusion, timber harvest, road construction, road obliteration and recreation. Table 23 summarizes past timber harvest from NFS lands within each subwatershed.

Table 2122. Summary of Past Forest Service timber sale activity by decade (acres)

Decade	Thomas Creek (170701030101)	Dry Creek (170601040801)	Phillips Creek (170601041101)
1950s	602	2	431

1960s	252	71	1,377
1970s	3,222	4,276	4,629
1980s	444	414	1,762
1990s	912	185	1,701
2000s	0	601	1,001
2010s	0	0	293

A land exchange with Boise Cascade in 1992 consisted of 800 acres along lower Phillips Creek including about 2.5 miles of Phillips Creek and 0.5 miles of East Phillips Creek. The exchange also included about 145 acres along Ninemile Ridge.

Present Actions

Livestock Grazing

The Thomas Creek project lies within the boundary of the North End Sheep Allotment. NEPA was recently completed for the allotment (USFS 2011) and the grazing permit is administered through the allotment management plan and annual operating instructions.

Recreation

The Recreation Report describes the various forms of recreational activities that occur within the project area. There are multiple dispersed camping sites located in RHCAs within the Thomas Creek project.

Transportation Management

Motor vehicle and recreational off road vehicle use are administered via the Umatilla National Forest motor vehicle use map (MVUM). The MVUM shows designated NFS roads and trails that allow motor vehicle use, in addition to types of vehicles and seasonal use restrictions.

Invasive Weeds Treatment

The Invasive Plants Report identifies about 2,800 acres of invasive species within the project area. Weeds treatment activities would continue to occur along roads and in areas described in the Umatilla National Forest Weeds EIS (2010). New invasive plant populations can be treated after undergoing the Early Detection Rapid Response protocol. All weed treatment activities will adhere to the herbicide label for mixing and application rates for the weed being treated. Design features, as described by the Weed EIS, would be followed during implementation.

Reasonably Foreseeable Future Actions

The High Buck Project boundary would include about 1,154 acres in the Thomas Creek subwatershed and 4,021 acres in the Phillips Creek subwatershed. This project would include commercial and non-commercial thinning with analysis scheduled for 2017 and implementation beginning in 2018.

Climate Change

The ability to maintain existing high quality habitats and to restore degraded habitats will be influenced by climate change over the next several decades with projected higher average air temperatures, more winter precipitation falling as rain versus snow, and diminishing winter snow packs resulting in earlier snowmelt. Changes in runoff volume and lower summer base flows,

higher surface water temperatures, and likely greater year-to-year variability in precipitation could also result in extended drought periods and more severe floods than have occurred in recent history. Changes in timing and amount of runoff associated with climate change affect every resource, including terrestrial vegetation, wildlife, riparian and aquatic species, and water availability for human use.

Lute and Abatzoglou (2014) predict that hydroclimatic changes in the western U.S. are expected to accelerate in the coming decades as human induced changes in temperature and precipitation become more profound (Ashfaq et al 2013). Changes in snowfall accumulation combined with warmer spring temperatures are projected to result in significantly earlier snowmelt and subsequent runoff, lower summer baseflow, and decreased summer surface runoff. In the western United States, the implications of these changes for snow metrics have already been observed in the form of less precipitation falling as snow, decreased April 1 snow water equivalent, earlier snowmelt, decreased spring snow cover extent, and shortened snow cover duration. In the Blue Mountain region of the Umatilla National Forest declines of 20-30% are projected for snowfall water equivalents and number of snow days.

Direct and Indirect Effects by Alternative

Refer to *Description of Project Alternatives* in the beginning of this report for a detailed description of the alternatives. A comparison of treatments by alternative can be found in Table 1. Appendix A, attached to this report contains a list of all design features to follow during the implementation of action alternatives. Utilization of the design criteria will ensure that the impacts to fisheries/aquatic resources are minimized.

Alternative A – No Action

There are no direct or indirect effects under this Alternative. Under Alternative A of the Thomas Creek Restoration Project, the FS would not change management in the project area; there would be no proposed road maintenance/construction, harvest, thinning, prescribed burning or in-stream restoration activities. Therefore, there would be no mechanism for direct or indirect effects to ESA listed fish species, their DCH, Essential Fish Habitat (EFH) or USFS R6 sensitive fish and aquatic invertebrates and their habitat.

The forest vegetation along streams in the Thomas Creek Restoration Project Area ranges from heavy forest to grassy meadows and scab land. In the units, it is predominantly dense forest. As the trees grow, ground fuels accumulate, and ladder fuels expand the connection between ground fuels and the canopy. This process contributes to the risk of wildfire and to the risk that ground fire would spread to the forest canopy.

Fire effects may be beneficial or detrimental, depending on fire severity. Beneficial effects of low severity fires include killing small conifers and the occasional mature conifer, which could fall on the floodplain as woody material and retain sediment, expand floodplains, and increase the capacity of the shallow aquifer.

In addition, low severity fire may reduce conifer encroachment on streams and springs, thereby increasing hardwood habitat and productivity. Fire mortality of the small conifers may open up sites for hardwoods to grow, either from plants suppressed by conifers, from hardwood sprouting, or from natural seeding. Hardwood leaf litter is more productive in the fish food chain than conifer litter. Hardwoods tend to increase bio-diversity. They also tend to grow faster than conifers, so the lost shade is replaced quickly.

Low severity fires may locally burn off grass and sedge thatch, which results in vigorous resprouting and growth, and quickly stabilizes the soil. Locally eroded soil may be deposited in channels and floodplains and provide hardwood habitat.

Post-fire mortality in riparian areas of both the Biscuit and B&B Complex Fires resulted in reduced canopy cover over streams, thus leading to higher stream temperatures (USDA Forest Service, 2004, 2005). This elevation in stream temperature can impact aquatic organisms in the short-term. However, increases in vegetative cover over streams between the second and fourth year after the B&B Complex Fire suggest that stream shade is recovering, thus ameliorating impacts of fire on aquatic organisms (Halofsky and Hibbs, 2009). Similar riparian effects would be expected if a high severity fire were to occur in the project area.

All other processes currently occurring within the project area would continue under this Alternative. Sedimentation from road use would remain at the on-going levels under this alternative.

Action Alternatives Effects on Fisheries Indicators

Alternative B – Proposed Action

Stream Temperature

According to the Hydrology Specialist Report, Alternative B would not impact water temperature because thinning, burning, and placing large wood into streams would not measurably remove the shade component along any stream channel. Under Alternative B, only 301 acres of thinning activities would occur within Category I and II RHCAs and it would all be outside the shade producing area.

No changes to channel condition from silvicultural treatments are expected because water yield and peak flow will not be affected, and therefore, morphological channel changes which could affect stream temperature would not occur. Danger trees would be felled along all haul routes used in the proposed timber sales. Most stream crossings on haul routes are ephemeral or intermittent with no or very low summer flows. Danger trees felled along haul routes within RHCAs of perennial streams would have negligible effect on shade density for affected streams. Specific design criteria pertaining to danger trees within RHCAs can be found in Appendix A of this report.

During harvest fuel treatment, underburning will occur in stands with residual fire resistant tree species. Direct ignition within perennial RHCAs is not allowed, however fire will be allowed to back into RHCAs. Prescribed fire may occur near perennial water in some locations. It is unlikely that this type of low intensity fire would kill shade-producing vegetation. Therefore, it is unlikely that the density of shade on water would be affected to the degree necessary to affect water temperature. Other harvest fuel treatments would rely on hand or machine piling outside of the primary shade zone. During landscape burning, no created openings of any size are expected inside Category I and II RHCAs. There will be no measurable impacts to shade and therefore water temperature from landscape burning within Category I and II RHCAs.

Hardwood and conifer planting may occur in the RHCAs. Hardwood and conifer release are expected to occur during the short term (1-5 years), while hardwood and conifer plantings are

expected to take longer to become established and begin to provide effective shade (5 to 10 years). The net result would be an increase in near-stream shade.

Enhancing hardwoods by removing competing conifers and/or planting would provide shade in the short and longer term. Thinning of off-site ponderosa pine and thinning other overly dense conifers is expected to improve the health and resilience of the remaining stand and therefore help to maintain overstory shade for the long term. These activities would maintain stream temperature in the long term.

This project would not change the angular canopy density and therefore shading would be maintained along all perennial streams. Because shade would not be changed, water temperature changes due to increased solar loading would not occur from this project. The Project would **not degrade** this indicator under Alternative B.

Sedimentation

Soil erosion is a natural process. Management activities and/or natural disturbances (i.e. fire, floods…) can accelerate these processes through the reduction or removal of vegetative ground cover and canopy cover or both. Other site factors influencing rates of erosion include soil type and topography. Impacts of proposed management activities on sedimentation will be analyzed by comparing natural background sedimentation (Soils Report) and the existing RHCA road system with the proposed miles of RHCA log haul, thinning and mechanical fuel treatments in RHCAs, activity fuel treatments in RHCA, and landscape prescribed burning.

Proposed ground disturbing activities which may result in runoff include harvesting operations, road construction, maintenance and use, mechanical site preparation and prescribed fire. Common sources of accelerated erosion rates associated with timber harvest are the development of roads and skid trails and removal of ground cover by harvest activities, site preparation, slash disposal operations or by high intensity fire effects under burn piles. Through the implementation of best management practices (BMPs) and other design features, the impacts of management activities on sedimentation are expected to be minimized.

Sediment modeling indicates that the existing road system would continue to be the main source of sustained sediment input to streams. Short term risk of sediments being mobilized during rainfall would increase during road maintenance, construction and reconstruction. Design features related to timing of activities and installation of physical erosion measures would minimize the risk of erosion in the short term. Road maintenance and reconstruction, followed by closing/stabilizing Level 1 roads and obliteration of new temporary roads would reduce road-related sediment during the longer term. Appendix A, of this report, contains design features addressing all road management activities.

According to the Hydrology specialist's report, although disturbance and compaction could occur in the Riparian Habitat Conservation Areas from low-impact ground-based equipment, it would not be to the magnitude, extent, or duration to cause sediment to enter stream channels. The allowable impacts of equipment that could be used for thinning are described in the Soils Report. Protection of soil resources is provided by the use of BMPs that minimize the potential for soil disturbance. Because project activities have the potential to affect hillslope erosion and sedimentation, surface erosion modelling was used to inform design features to protect soils and minimize sedimentation. These design criteria would prevent damage that could contribute to erosion and sedimentation into channels and streams.

There would be log haul on approximately 15.0 miles of roads within RHCAs. Erosion on these roads would be more likely to increase suspended sediment in streams than haul outside of RHCAs. Roads inside RHCAs and with culvert problems are the most likely to contribute sediment to surface waters currently. Because of the design criteria, it is not expected that the activities in RHCAs would cause measurable increases in sedimentation.

Prescribed landscape burning and fuels reduction treatments could cause a reduction in cover and an increase in bare soil. These activities could lead to greater sensitivity and risk of erosion in the short term. Through the implementation of BMPs and design features (Appendix A) the probability of measurable soil input into stream channels would be low. This risk would not extend beyond the first growing season due to regrowth of surface vegetation and accumulation of natural mulches.

As per design features found in Appendix A of this report, "No ignition would occur in Category I and II RHCAs during fuels treatments, although fire would be allowed to back into them where they are adjacent to prescribed fire." There would be very little effect to existing down material and vegetation density in near channel positions. The potential for sediment to reach channels from these treatments is very low.

Phillips Creek has been identified for restoration needs to improve channel morphology and in-stream processes. Woody material would be placed in the Phillips Creek during low flow conditions, which would minimize sedimentation and turbidity caused by bank and bed disturbance. An erosion control plan would be developed as part of the project design. The erosion control plan would include turbidity monitoring and measures to ensure turbidity levels do not exceed Clean Water Act thresholds during implementation.

Some channel adjustments may occur in the vicinity of large wood placements. Lateral channel migration, scour pools and point bars are common occurrences when large wood is added to a stream. These channel adjustments typically occur during the high runoff events, within the first few years, post project implementation. An increase in turbidity from placing wood into the stream will likely come from the wood causing the mobilization of sediments already within the stream channel. High flows that occur during spring snowmelt or rain-on-snow events are naturally high in turbidity and would likely mask turbidity generated as a result of large wood placement. According to the Hydrology specialist report, short term effects to turbidity from stream restoration activities are allowed under ODEQ's antidegradation policy.

The proposed activities would cause a limited amount of soil exposure with the possibility of erosion. Eroded soil has the potential to increase stream sedimentation. However, all of these activities have been designed to minimize effects to sedimentation. The designs include the use of Best Management Practices, Design Criteria, and Management Requirements from the Forest Plan. The Project would **not degrade** this indicator under Alternative B.

Large Woody Debris

The proposed activities under this alternative will increase in woody debris available for streams. Hazard trees may be felled within RHCAs and left there to contribute to channel function by providing down wood to retain sediment and help meet LWD RMOs. Similarly, prescribed fire may cause tree mortality in the RHCA's and provide for future LWD recruitment to the streams.

Phillips Creek is the major fish bearing stream in the project area that has been identified for restoration needs to improve channel morphology and in-stream processes. Woody material would be placed directly in Phillips Creek. The exact location and quantities of wood to be placed in the stream have yet to be determined but would focus on the upper most 4-5 miles (Reach 3) and would likely affect approximately 1.5 miles within that reach. The stream restoration project design would utilize existing data and collected on-site hydrologic and geomorphologic features to determine the best location of wood placement. The total wood (existing and placed) within the restoration reach would exceed the PACFISH standard of 20 pieces per mile.

Hazzard tree felling, within RHCAs, along with instream and riparian hardwood restoration activities would increase LWD amounts in Phillips Creek in both near and long term and make progress toward meeting LWD RMOs in that watershed. Effects to other streams would remain unchanged. The Project, under Alternative B, would **not degrade** this indicator across the project area and **improve** this indicator within Phillips Creek watershed.

Pools/mile

There would be no direct effects from timber harvest, thinning or burning to pool frequency because these activities would not occur within the bankfull channel. Proposed treatment within RHCAs would move stand structure and composition toward HRV and improve in-stream fish habitat. Treatment of riparian zones was identified as a need to enhance hardwoods. Enhancing hardwoods by removing competing conifers and/or planting would provide shade in the short and longer term. Thinning of off-site ponderosa pine and thinning other overly dense conifers is expected to improve the health and resilience of the remaining stand and therefore help to maintain overstory shade for the long term.

The placement of large wood in Phillips Creek will improve pool frequency upon implementation of the in-stream restoration project. The stream will start to scour the bed adjacent to the large wood due to a change in hydraulics of the stream. Over time the pool quantity and quality will improve due to high flows in the spring.

Indirect effects would occur during the long-term (decades) as a result of improved streamside vegetation stand structure and composition using silvicultural and prescribed fire techniques aimed at maintaining a relatively even delivery of large woody debris to the channel and providing a mix of riparian tree species.

Pool frequencies may increase with the addition of large wood and riparian woody vegetation in Phillips Creek and help to meet pool frequency RMOs at the subwatershed and watershed scales. Currently, Dry Creek is the only fish bearing stream in the project area not meeting ICBEMP pool frequency recommendations. Effects to other streams would remain unchanged. The Project, under Alternative B, would **not degrade** this indicator across the project area and **improve** this indicator within the Phillips Creek watershed.

Width/Depth ratio

There would be no direct effects from timber harvest, thinning or burning to width-depth ratios because these activities would not occur within the bankfull channel.

Direct effects to Width/Depth ratio are expected to occur when large woody debris is placed into Phillips Creek. Reintroducing roughness features (wood) would result in a more complex regime

of bank and bed scour and in-channel deposition, which is expected to be closer to the historic regime. Rosgen (1996) found that channel stability and biological function of type 'B' streams is directly linked to the type, amount and extent of woody debris.

Thinning and leaving some conifers in the bankfull channel and the floodplain or floodprone area of all stream classes would add structure that helps to dissipate energies associated with high stream flows (e.g. spring runoff), adds to bank stability and also aids in retaining sediment to help build floodplains and provides a growth medium for bank stabilizing vegetation.

Indirect effects would occur during the long-term (decades) as a result of improved streamside vegetation stand structure and composition using silvicultural and prescribed fire techniques aimed at maintaining a relatively even delivery of large woody debris to the channel and providing a mix of riparian tree species.

Width-depth ratios may improve with the addition of large wood and riparian woody vegetation in Phillips Creek. However, it is unlikely that they will met the original PACFISH RMO since B-channels typically do not develop that type of cross-sectional channel morphology. Effects to other streams would remain unchanged. The Project, under Alternative B, would **not degrade** this indicator across the project area and would **improve** this indicator within Phillips Creek, moving the watershed towards Riparian Management Objectives for this indicator.

Alternative C

Stream Temperature

Changes from Alternative B include a reduction of potential Category II RHCA treatment area from 42 acres to 19 acres in the Thomas Creek subwatershed. This small change in affected area is within the scale of effects analyzed for Alternative B. Design features described in Appendix A are applicable to this alternative for the maintenance of canopy density within the primary and secondary shade zone. Stream shade and water temperatures would be maintained.

The Project would **not degrade** this indicator under Alternative C.

Sedimentation

Alternative C would result in an overall increase of 74 treatment acres compared to Alternative B. Changes from Alternative B also include a reduction of 20 acres of treatment and 0.14 miles of road within Category II and IV RHCAs in the Dry and Thomas Creek subwatersheds. Alternative C would add one temporary culvert in a Class IV stream, as in Alternative B. Unit 39 would be dropped and this would eliminate one ML1 haul route stream crossing at a Class IV stream, compared to Alternative B. Haul routes in RHCAs would be reduced from 15.0 miles under Alternative B to 14.9 miles in Alternative C. These small changes in affected area are within the scale of effects analyzed for Alternative B.

Road maintenance and reconstruction along haul routes would decrease the potential for water to accumulate, concentrate and runoff of road surfaces, which would decrease the potential for roadbed sediment to enter into stream channels. Design features described in Appendix A are applicable to this alternative for the protection of water quality due to sedimentation from treatment areas and haul roads. Sediment delivery to stream channels would be reduced relative to Alternatives A and B under this alternative.

The Project would **not degrade** this indicator under Alternative C.

Large Woody Debris

The effects of implementing Alternative C on this indicator would be the same as those from Alternative B. The Project, under Alternative C, would **not degrade** this indicator across the project area and would **improve** this indicator within Phillips Creek, moving the watershed towards Riparian Management Objectives for this indicator.

Pools/mile

The effects of implementing Alternative C on this indicator would be the same as those from Alternative B. The Project, under Alternative C, would **not degrade** this indicator across the project area and would **improve** this indicator within Phillips Creek, moving the watershed towards Riparian Management Objectives for this indicator.

Width/Depth ratio

The effects of implementing Alternative C on this indicator would be the same as those from Alternative B. The Project, under Alternative C, would **not degrade** this indicator across the project area and would **improve** this indicator within Phillips Creek, moving the watershed towards Riparian Management Objectives for this indicator.

Alternative D

Stream Temperature

Changes from Alternative B include a reduction of potential Category I and II RHCA treatment areas from 301 to 277 acres. Effects to shade-producing vegetation would be less than under Alternative B and this small change in affected area is within the scale of effects analyzed for Alternative B. Design features described in Appendix A are applicable to this alternative for the maintenance of canopy density within the primary and secondary shade zone. Stream shade and water temperature would be maintained.

The Project would **not degrade** this indicator under Alternative D.

Sedimentation

Alternative D would result in an overall reduction of 129 treatment acres compared to Alternative B. Changes from Alternative B also include a reduction of 64 acres of treatment within Category I, II and IV RHCAs. Haul routes in RHCAs would be reduced from 15.0 miles under Alternative B to 13.9 miles in Alternative D. There would be 10 fewer road-stream crossings in the project area. These small changes in affected area are within the scale of effects analyzed for Alternative B.

Road maintenance and reconstruction along haul routes would decrease the potential for water to accumulate, concentrate and runoff of road surfaces, which would decrease the potential for roadbed sediment to enter into stream channels. Design features described in Appendix A are applicable to this alternative for the protection of water quality due to sedimentation from treatment areas and haul roads.

The Project would **not degrade** this indicator under Alternative D.

Large Woody Debris

The effects of implementing Alternative D on this indicator would be the same as those from Alternative B. The Project, under Alternative D, would **not degrade** this indicator across the project area and would **improve** this indicator within Phillips Creek, moving the watershed towards Riparian Management Objectives for this indicator.

Pools/mile

The effects of implementing Alternative D on this indicator would be the same as those from Alternative B. The Project, under Alternative D, would **not degrade** this indicator across the project area and would **improve** this indicator within Phillips Creek, moving the watershed towards Riparian Management Objectives for this indicator.

Width/Depth ratio

The effects of implementing Alternative D on this indicator would be the same as those from Alternative B. The Project, under Alternative D, would **not degrade** this indicator across the project area and would **improve** this indicator within Phillips Creek, moving the watershed towards Riparian Management Objectives for this indicator.

Alternative E

Stream Temperature

Riparian treatments would be the same as for Alternative B. Default PACFISH buffers would be applied to RHCAs of the additional 23 units (34 acres Category I and II RHCAs) therefore there would be no change to existing stream shade-producing vegetation within these stands. Stream shade and water temperature would be maintained.

Compared to Alternative B, there would be an additional 2.0 miles of haul roads in Category I RHCAs along Phillips Creek (FR3738), including 5 Class III stream crossings. FR3738 is an open NFS road and, other than hazard tree removal, log haul would not change the amount of stream shade-producing vegetation in the RHCA.

Effects to shade-producing vegetation would be similar to those under Alternative B and this small change in affected area is within the scale of effects analyzed for Alternative B. The Project would **not degrade** this indicator under Alternative E.

Sedimentation

Alternative E would result in an overall increase of 522 treatment acres compared to Alternative B. Compared to Alternative B there would be no additional RHCA treatment and default PACFISH buffers would be applied to all streams in these units. Sediment modeling has shown that a minimum 75 foot buffer is needed to prevent sedimentation to stream channels.

The amount of new temporary road construction would be the same as Alternative B. Alternative E includes an additional 8.5 miles of NFS roads that would be used for log haul. Road maintenance and reconstruction along haul routes would decrease the potential for water to accumulate, concentrate and runoff of road surfaces, which would decrease the potential for roadbed sediment to enter into stream channels. Design features described in Appendix A are applicable to this alternative for the protection of water quality due to sedimentation from treatment areas and haul roads. These changes in affected area are within the scale of effects analyzed for Alternative B.

The effects of implementing Alternative E on this indicator would be similar to those from Alternative B. The Project would **not degrade** this indicator under Alternative E.

Large Woody Debris

The effects of implementing Alternative E on this indicator would be the same as those from Alternative B. The Project, under Alternative E, would **not degrade** this indicator across the project area and would **improve** this indicator within Phillips Creek, moving the watershed towards Riparian Management Objectives for this indicator.

Pools/mile

The effects of implementing Alternative E on this indicator would be the same as those from Alternative B. The Project, under Alternative E, would **not degrade** this indicator across the project area and would **improve** this indicator within Phillips Creek, moving the watershed towards Riparian Management Objectives for this indicator.

Width/Depth ratio

The effects of implementing Alternative E on this indicator would be the same as those from Alternative B. The Project, under Alternative E, would **not degrade** this indicator across the project area and would **improve** this indicator within Phillips Creek, moving the watershed towards Riparian Management Objectives for this indicator.

Cumulative Effects by Alternative

Alternative A – No Action

Cumulative impacts result from the incremental impact of the action **when added** to other past, present and reasonably foreseeable future actions. Since there is no action under Alternative A, there are no direct or indirect effects and therefore no cumulative effects.

Species composition and structural changes at the landscape scale described in the Vegetation Report would not occur by mechanical means, therefore succession would remain on its current trajectory further away from landscape range of variation.

Stream temperatures would be unaffected under the No Action Alternative. Phillips and Dry Creeks would continue to exhibit discontinuous to intermittent flow regimes during the summer and fall, with influent groundwater maintaining summer water temperatures to support anadromous salmonids. Spring Creek would continue to maintain perennial flow and water temperatures would continue to exceed the threshold for bull trout. Thomas Creek would

continue to exhibit intermittent flow along FR 32 until its confluence with Spring Creek and water temperature would also continue to exceed the bull trout temperature standard.

Under the no action alternative, the current road densities, road use designations and use patterns within the analysis area would not change. Motor vehicle and recreational off road vehicle use would continue to occur on routes designated on the Umatilla National Forest motor vehicle use map (MVUM). Erosion and sedimentation from roads would continue as roads are used and maintained according to their respective maintenance level. Continued deferred maintenance of the majority of system roads would be the primary management related sources of accelerated erosion. Natural disturbance events such as fires and floods could affect stream temperature and sediment regimes over time, if these events cause large-scale changes to vegetation or stream channel morphology.

The hydrologic function of streams in the project area would continue to recover within the limitations of past and present management (timber harvest and roads) and periodic high flow events. Portions of Phillips Creek would remain deficient of large woody material due to past timber harvest. These stream segments would remain at higher risk to adverse channel adjustments from high stream flows due to the general lack of large woody structure. Large scale fire could affect water yield and peak flows, with resultant adverse effects to channel and riparian condition, with resultant loss of fish habitat.

Alternative B – Proposed Action

Stream Temperature

In the proposed project, prescribed fire ignition will not occur within 300 feet either side of fish bearing streams, within 150 feet each side of perennial non-fish bearing streams, or within 100 feet of springs and other isolated wetlands. Shade will not be affected and there will be no effect to water temperature at the reach scale from the proposed project and so no mechanism for cumulative effects to water temperature.

Road construction and previous timber sale activities on Forest Service lands and former private lands that are now FS lands removed shade-producing vegetation along portions of perennial streams. Those activities resulted in a higher exposure of surface water to solar radiation. The last timber sales within what are now RHCAs occurred nearly 25 years ago. The Pedro-Colt Timber Sale ended in 2007 and there were no vegetation treatments within RHCAs. The Plentybob Timber Sale ended in 2010 and there were no vegetation treatments in RHCAs. Occasional hazard trees are felled along roads within RHCAs and this activity has a negligible effect to shade.

Dispersed camping occurs along Phillip Creek at 3 sites and this activity has a localized effect on vegetation. One large dispersed area near the mouth of East Phillips Creek was obliterated in 2013.

Approximately 30 miles of roads have been decommissioned in the three subwatersheds during the past 20 years, including roads up Spring Creek and upper Dry Creek. These roads are effectively closed to motor vehicles and are slowly being overtaken by alder. The combined effects of these activities have had a positive effect to shade-producing vegetation in RHCAs.

Alternative B would temporarily open 0.12 miles of maintenance level 1 (closed) roads and construct 0.03 miles of new temporary roads for log haul in RHCAs with perennial streams.

These activities would not remove any overstory shade-producing trees, although understory hardwoods, such as alder would be cut.

There would be no cumulative effects to stream shade or water temperature as a consequence of implementing this alternative.

Sedimentation

Past actions including grazing, fires, fire exclusion, harvest, road construction, road obliteration and recreation have occurred in the project area. Plant species composition and ground cover have changed and invasive plant species are present.

Effects to water quality are directly linked to water yield. If erosion from a road or upslope treatment does not enter into a waterbody, there would be no effect to water quality. Sediment transport occurs primarily during spring runoff. For more information on sedimentation, see the Hydrology and Soils Reports.

Temporary roads will be decommissioned after use. Decommissioning will reduce sediment potential and help restore infiltration capacity. Decommissioning may include blocking, ripping/scarifying, seeding, and possible mulching with emphasis to improve hydrologic soil function. BMP monitoring of decommissioned temporary roads would be performed to help ensure resultant erosion is reduced to background levels.

No cumulative sediment effects are expected because design criteria and BMPs shape the actions proposed in this project such that no measurable sediment is expected to reach surface waters. See also the Soils Report.

Large Woody Debris

Historic logging in the riparian areas likely affected large wood recruitment in watershed streams. Dispersed recreation may have impacted and could still impact in-stream large wood and potential recruitment. Recreational impacts would come in the form of firewood cutters and campers utilizing wood from within the riparian areas.

The addition of large wood to Phillips Creek would have a local effect. The upper 5 miles of Phillips Creek, outside of clearcut units, would have active recruitment of large wood, improving an actual estimated 1.5 miles within this 5 miles of stream, and this alternative would enhance the ability of this stream segment to dissipate flood flows, detain sediment, build floodplain and improve fish habitat, reducing the cumulative effects to LWD that have already occurred. The lower 3 miles of Phillips Creek is deficient of both in-stream large wood and potential recruitment of large wood and this project would not change that because there are no treatments proposed along this reach. The added LWD in the upper 5 miles of Phillips Creek would help to move the entire watershed towards meeting RMOs, though the improvement may not be measurable at the watershed scale.

Pools/mile

Historic logging and recreational impacts likely affected pools/mile over time by reducing the amount of large wood available for recruitment. This has led to a reduction in stream channel roughness, bed scour and in-channel deposition.

The addition of large wood to Phillips Creek (Reach 3) under the proposed action would improve pools/mile on a reach scale and reduce the cumulative effects of activities that have already occurred. The reintroduction of wood to Phillips Creek would improve channel roughness, bed scour and in-channel deposition, which would interact to create additional pools and move the watershed towards meeting Riparian Management Objectives for pool frequencies and reduce the cumulative effects of past management.

Width/Depth ratio

Historic logging and recreational impacts likely affected width/depth ratio over time by reducing the amount of large wood available for recruitment. This has led to a reduction in stream channel roughness and in-channel deposition.

The addition of large wood to Phillips Creek (Reach 3) under the proposed action would improve Width/Depth ratio on a reach scale. The reintroduction of wood to Phillips Creek would improve channel roughness, bed scour and in-channel deposition and reduce the cumulative effects of past management.

Effects to other streams within the project area would be seen over time. Thinning and leaving some conifers in the bankfull channel and the floodplain or floodprone area of all stream classes would add structure that helps to dissipate energies associated with high stream flows (e.g. spring runoff), adds to bank stability and also aids in retaining sediment to help build floodplains and provides a growth medium for bank stabilizing vegetation.

These effects would occur during the long-term (decades) as a result of improved streamside vegetation stand structure and composition using silvicultural and prescribed fire techniques aimed at maintaining a relatively even delivery of large woody debris to the channel and allowing sediment storage and transport processes to restore natural channel morphologies, reduce the cumulative effects of past management.

Alternative C

Cumulative effects under this alternative would be the same as those described in Alternative B.

Alternative D

Cumulative effects under this alternative would be the same as those described in Alternative B.

Alternative E

Cumulative effects under this alternative would be the same as those described in Alternative B.

Compliance with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans

All of these alternatives would be consistent with Forest Plan direction regarding native fish populations. None of the potential effects of timber, fire/fuels management and stream

restoration activities under any of these alternatives would be expected to retard progress towards PACFISH Riparian Management Objectives. Application of PACFISH direction would maintain or improve fish habitat conditions in the analysis area therefore there would not be adverse modifications to designated critical habitat or essential fish habitat. There would be no adverse effects to listed fish from any activities under any action alternative, other than instream habitat improvement projects. Short-term adverse effects to ESA listed steelhead may occur during instream restoration activities, with longterm benefits to the species and their habitats. Aquatic restoration activities have already been consulted for listed species and their designated critical habitats under a programmatic Aquatic Restoration Biological Assessment and Biological Opinion. All proposed activities are consistent with applicable PACFISH standards and guides. Columbia Basin Ecosystem Management Project (ICBEMP) summary values were incorporated into the analysis as directed under ICBEMP memorandum FS agreement No. 03-RMU-11046000-007.

Effects to Management Indicator Species

For redband trout, a Forest management indicator species, no alternatives would result in any direct, indirect or cumulative population level impacts nor a negative habitat trend at either the watershed or Forest scale.

Resident redband trout and their habitat may be affected by harvest, burning and road management activities, particularly where those activities occur within RHCAs. Project design criteria and BMP monitoring would ensure that the probability and magnitude of those effects remain both unlikely and immeasurable to the extent they occur. Instream habitat improvement activities in Phillips Creek in the Cabin Creek watershed would be expected to create temporary disturbance, but provide longterm habitat benefits to resident redband trout.

As a result, the proposed activities under these alternatives would not affect the viability of redband trout at the watershed scale. Thus, continued viability for redband trout as a species is expected on the Umatilla National Forest under all alternatives.

For steelhead, a Forest management indicator species, the overall direct and indirect effects of any of this project's action alternatives would limit effects to steelhead and their habitat at the project scale and thus at the forest scale, due to distance from project activities, and due to project design criteria and BMP monitoring that will ensure any impacts from activities to the fish habitat indicators in the Phillips Creek and Dry Creek watershed portions of the analysis area would be unlikely and immeasurable, with the exception of Large Wood restoration. The Large Wood restoration would entail short-term direct and indirect disturbance to fish and their habitats, with long-term benefits to steelhead and their habitat in the upper 5 miles of Phillips Creek in the Cabin Creek watershed, ultimately reducing cumulative effects to steelhead and their habitat to a small degree. No alternatives would reduce population viability or result in a negative habitat trend at either the watershed or Forest scale.

During the 5-year ESA status review of the Middle Columbia River steelhead, the overall rating for the Umatilla/Walla Walla River populations remains at a "maintained" status, while the 5-year ESA status review of Snake River Basin steelhead determined that the Grande Ronde River populations remain not viable (NMFS, 2011). This project would support recovery of populations in the Grande Ronde MPG and would not retard recovery of populations in the Umatilla/Walla Walla MPG. The project is consistent with the Forest Plan as amended by PACFISH; none of the project alternatives would retard recovery of Middle Columbia River or

Snake River Basin steelhead within NFS lands; they are all consistent with relevant standards and guidelines for the various activities.

First Foods

The Thomas Creek Restoration Project alternatives would not impact fisheries resources, which are one of the First Foods valued by Native American tribal members, who hunt and gather salmonid species in their usual and accustomed areas within the analysis area. The determination was made that the project "may effect, but are not likely to adversely affect" Snake River Basin steelhead or their designated critical habitat. The project would have no impact to Chinook salmon which are not found within the project area. Long-term, the project is expected to support recovery of fisheries resources in the analysis area by restoring natural watershed and channel-forming processes and functions, including recovery of fish habitat structure and function.

Biological Evaluation and Determination of Effects

Mid-Columbia River steelhead and Designated Critical Habitat, Snake River Basin steelhead and Designated Critical Habitat, Snake River Spring/Summer Chinook salmon and Designated Critical Habitat, Bull trout and Designated Critical Habitat, Essential Fish Habitat (EFH), USFS R6 sensitive fish and aquatic invertebrates and their habitat

Alternative A

There are no direct or indirect effects under this Alternative. Under Alternative A of the Thomas Creek Restoration Project, the FS would not change management in the project area. There would be no proposed road maintenance/construction, harvest, thinning, prescribed burning or in-stream restoration activities. Therefore, there would be no mechanism for direct, indirect or cumulative effects to ESA listed fish species and their DCH, Essential Fish Habitat (EFH) or USFS R6 sensitive fish and aquatic invertebrates and their habitat.

Therefore, there would be ***no effect*** to Proposed, Endangered, and Threatened fish species and DCH and ***no impact*** to Sensitive fish and aquatic invertebrate species and their habitats considered in this analysis.

Mid-Columbia River steelhead and Designated Critical Habitat

Alternatives B, C, D and E

MCR steelhead are known to spawn and rear in 41.0 miles of streams within the Headwaters Umatilla River watershed. There are 67.2 miles of designated critical habitat (DCH) within the Headwaters Umatilla River watershed. The closest known spawning, rearing and designated critical habitats to the project area are located in Thomas Creek. Those habitats are approximately 0.7 miles downstream of the closest harvest unit (unit 45). There is no designated critical habitat for Mid-Columbia River steelhead within the project boundary.

Based on the distance from project activities, and due to project design features and BMP monitoring, there would be no direct, indirect or cumulative effects from the implementation of

the Thomas Creek Restoration Project under the proposed action Alternatives. The action alternatives all would have **'no effect'** on Mid-Columbia steelhead or their designated critical habitat.

Snake River Basin steelhead and Designated Critical Habitat

Alternatives B, C, D and E

The steelhead population that inhabits the Thomas Creek project area is part of the Grande Ronde River Major Population Group (MPG), within the Snake River Basin Steelhead DPS. They spawn and rear in 11.8 miles of stream within the Willow Creek and Cabin Creek watershed portions of the project area. There are 13.9 miles of designated critical habitat (DCH) for Snake River Basin steelhead within the project area.

SRB steelhead and their DCH may be indirectly affected by harvest, burning and road management activities, particularly where those activities occur within RHCAs. Project design criteria and BMP monitoring will ensure that the probability and magnitude of those effects remain both negligible and discountable. There would be no measurable cumulative effects to the species or to DCH. Therefore, the implementation of the Thomas Creek Restoration Project activities (harvesting, prescribed fire/fuels management and road management) under the proposed action Alternatives **'may effect, but are not likely to adversely affect'** Snake River Basin steelhead and **'May Effect but are Not Likely to Adversely Modify or Destroy Designated Critical Habitat'** for SRB steelhead.

Instream project work may have short-term direct and/or indirect adverse effects on SRB steelhead and their DCH from in-stream placement of Large Wood in Phillips Creek. The direct and/or indirect adverse effects would be minimized by implementation of Project design criteria, BMP Monitoring and compliance with Terms and Conditions of an existing programmatic aquatic restoration Biological Opinion, and would ultimately provide long-term habitat benefits to SRB steelhead and their DCH, and in the long-term would reduce cumulative effects in the project area to a small degree.

Effects of LWD restoration activities have already been consulted programmatically under the regional programmatic Aquatic Restoration Biological Assessment (ARBA) and Biological Opinion (ARBO). Because the short-term direct and indirect adverse effects and long-term cumulative benefits to SRB steelhead and their DCH from instream LWD restoration have already been considered through an existing consultation and Biological Opinion, they are not considered here further for determination of cumulative effects of the Thomas Creek project.

Chinook salmon, Designated Critical Habitat and Essential Fish Habitat

Alternatives B, C, D and E

Snake River spring/summer Chinook salmon are not found within the Thomas Creek project boundary. They can be found approximately 6.9 miles downstream of the project area in the Grande Ronde River (Figure 3). Designated critical habitat for the Snake River spring/summer Chinook salmon is not mapped but is described in narrative in the rule (64 FR 57399). Critical Habitat includes those waters that are accessible upstream of occupied habitat. The closest stream occupied by Snake River Spring Chinook salmon is the Grande Ronde River, approximately 6.9 miles

downstream of the Thomas Creek project boundary and 9.8 miles downstream from the closest harvest unit. Due to large segments of Dry Creek and Phillips Creek going dry during the summer months, Dry Creek, Finley Creek, Phillips Creek and East Phillips Creek will not be considered Designated Critical Habitat.

The Upper Grande Ronde River HUC contains 885.3 miles of EFH and is associated with the Snake River spring Chinook ESU. The closest occupied EFH within the Upper Grande Ronde River HUC is the Grande Ronde River, approximately 6.9 miles downstream of the Thomas Creek project boundary and 9.8 miles downstream from the closest harvest unit. Phillips Creek, and Dry Creek flow into the Grande Ronde River but are inaccessible to salmon during the spawning season due to large segments of dry stream channel in their lower reaches.

The Umatilla HUC contains 425.1 miles of EFH and is associated with the Mid-Columbia River spring Chinook ESU. Mid-Columbia Spring Chinook have been found in Thomas Creek approximately 1.8 miles downstream of the project boundary and 3.3 miles away from the closest harvest unit. EFH will not be discussed any further due to the distance from the Project Area and occupied EFH.

SRB spring/summer Chinook salmon and their DCH and salmon EFH will not be affected by timber management activities. There are no direct, indirect or cumulative effects from timber harvest, fuels treatments and road management activities, particularly where those activities occur within RHCAs. Project design criteria and BMP monitoring will ensure that the probability and magnitude of those effects remain both negligible and discountable. The project is consistent with the Forest Plan as amended by PACFISH. Therefore, the implementation of the Thomas Creek Restoration Project activities (harvesting, prescribed fire/fuels management and road management) under the proposed action Alternatives would have **No Effect** on SRB spring/summer Chinook salmon or their Designated Critical Habitat due to distance from occupied habitat and **'No Effect to Essential Fish Habitat'** for SRB spring/summer Chinook salmon due to the distance from the Project Area and EFH.

Instream project work would have short-term adverse effects on salmon EFH from in-stream placement of Large Wood in Phillips Creek. Those effects would be minimized through the implementation of project design criteria, BMP monitoring and compliance with Terms and Conditions of an existing programmatic aquatic restoration Biological Opinion, and would ultimately provide longterm habitat benefits to EFH. The instream work would have **No Effect** on SRB spring/summer Chinook salmon or their Designated Critical Habitat due to distance between the project and occupied habitat and the accessibility of the habitat in the project area.

Effects of LWD restoration activities have already been consulted programmatically under the regional programmatic Aquatic Restoration Biological Assessment (ARBA) and Biological Opinion (ARBO). Because the short-term direct and indirect adverse effects and long-term cumulative benefits to EFH from instream LWD restoration have already been considered through an existing consultation and Biological Opinion, they are not considered here further for determination of cumulative effects of the Thomas Creek project.

Bull trout and Designated Critical Habitat

Alternatives B, C, D and E

There are **no Bull trout** or their designated critical habitat within the Thomas Creek project boundary. Bull trout are known to occur in Thomas Creek but are approximately 1.7 miles downstream of the project area. The closest designated critical habitats are on the Grande Ronde River (~6.9 miles downstream of the project area) and the Umatilla River (~7.4 miles downstream of the project area). Based on the distance from project activities, and due to project design features and BMP monitoring, there would be no direct, indirect or cumulative effects from the implementation of the Thomas Creek Restoration Project under the proposed action Alternatives.

For the reasons stated above, the implementation of the Thomas Creek Restoration Project under the proposed action Alternatives would have **'no effect'** on Bull trout or their designated critical habitat.

Western Ridged Mussel

Alternatives B, C, D and E

Gonidea angulata is known to occur in the North Fork and South Fork Umatilla River and Birch, East Birch, Butter, North Fork Butter, McKay, Ryan, Squaw, Thomas, and Wildhorse Creeks in Umatilla County and in Blitzen and Grande Ronde Rivers in Union County.(Xerces Freshwater Mussel database 2009). Those found in Thomas Creek are located approximately 1.7 miles downstream of the Thomas Creek Project boundary. Western Ridged mussel is not known to occur within the project boundary. Dry Creek, Phillips Creek, and East Phillips Creek have large segments of their streams go dry during the summer months. Based on the distance from project activities, intermittent stream channels and due to project design features and BMP monitoring, there would be no direct, indirect or cumulative effects from the implementation of the Thomas Creek Restoration Project under the proposed action Alternatives.

For reasons similar to those stated above for bull trout, the implementation of the Thomas Creek Restoration Project under the proposed action Alternatives would have **'no impact'** to Western Ridged Mussel individuals or their habitat.

Shortface Lanx

Alternatives B, C, D and E

Shortface Lanx, aka Giant Columbia River Limpet, are not known to occur within or adjacent to the Thomas Creek Project area. Dry Creek, Phillips Creek, and East Phillips Creek have large segments of their streams go dry during the summer months. Small populations are known to occur in the Grande Ronde in Washington and Oregon. The Grande Ronde River is approximately 6.9 miles downstream of the project boundary. Based on the distance from project activities, intermittent stream channels and due to project design features and BMP monitoring, there would be no direct, indirect or cumulative effects from the implementation of the Thomas Creek Restoration Project under the proposed action Alternatives.

Freshwater limpets, were found in Ryan Creek subwatershed of the Headwaters Umatilla River watershed during 2003, based on field data provided by CTUIR mollusk biologists, to Xerces.org. They are presumed to be shortface lanx in the absence of definitive identification to species. Although they have been found within the same watershed as the Thomas Creek project, the

location of the discovery in the Ryan Creek subwatershed is approximately 10 miles from the project boundary and within a separate subwatershed.

For reasons similar to those stated above for bull trout, the implementation of the Thomas Creek Restoration Project under the proposed action Alternatives would have **'no impact'** to Shortface Lanx individuals or their habitat.

Westslope Cutthroat

Alternatives B, C, D and E

There are no Westslope cutthroat trout located in the Thomas Creek project area. The only known or suspected populations are located in high-elevation watersheds of the John Day River basin.

For that reason, the implementation of the Thomas Creek Restoration Project under the proposed action Alternatives would have **'no impact'** to Westslope cutthroat trout individuals or their habitat.

References

Behnke, R. J. 1979. Monograph of the native trouts of the genus Salmo of western North America. US Forest Service, Region 2, Lakewood, Colorado.

Bond, C. E. 1992. Notes on the nomenclature and distribution of the bull trout and the effects of human activity on the species. In: .E. Reiman and J. D. McIntyre. Demographic and habitat requirements for conservation of bull trout. U.S. Department of Agriculture, Forest Service, Intermountain Research Station, General Technical Report INT-302, September 1993. 38 pp.

Cavender, T. M. 1978. Taxonomy and distribution of the bull trout (*Salvelinus confluentus*) from the American Northwest. California Fish and Game. 64(3): 139-174.

Elmore, Wayne and Robert L. Beschta, Riparian Areas, Perceptions in Management; Rangelands, Vol. 9, No. 6 (December, 1987), pages 260-265.

Ford, M.J. (Ed.), T. Cooney, P. McElhany, N. Sands, L. Weitkamp, J. Hard, M. McClure, R. Kope, J. Myers, A. Albaugh, K. Barnas, D. Teel, P. Moran and J. Cowen. 2010. Status Review Update for Pacific Salmon and Steelhead Listed Under the Endangered Species Act: Northwest. Draft U.S. Department of Commerce. NOAA Technical Memorandum NOAA-TM-NWFSC-XXX. 346 p. [Online] URL:http://www.nwr.noaa.gov/Publications/Biological-Status-Reviews/upload/SR-2010-all-species.pdf (last accessed August 15, 2014).

Frest, T. J., and E. J. Johannes. 1995. Interior Columbia Basin mollusk species of special concern. Final report: Interior Columbia Basin Ecosystem Management Project, Walla Walla, WA. Deixis Consultants, Seattle, WA. Contract #43-0E00-4-9112. 274 pp. plus appendices.

Haas, Gordon R. and J. D. McPhail. 1991. Systematics and distribution of Dolly Varden (*Salvelinus malma*) and bull trout (*Salvelinus confluentus*) in North America. Canadian Journal of Fisheries and Aquatic Sciences. 48: 2191-2211.

Halofsky, J.E., Hibbs, D.E., 2009. Controls on early post-fire woody plant colonization in riparian areas. Forest Ecology and Management vol. 258, issue 7 (September 2009).

Hankin, D.G., and G.H. Reeves. 1988. Estimating total fish abundance and total habitat area in small streams based on visual estimation methods. Canadian Journal of Fisheries and Aquatic Sciences 45: 834-844.

Lawler J. J., M. Mathias, A. E. Yahnke, and E. H. Girvetz. 2008. Oregon's Biodiversity in a Changing Climate. Report prepared for the Climate Leadership Initiative, University of Oregon.

Luce, C.H. and Z.A. Holden, Declining annual streamflow distributions in the Pacific Northwest United States, 1948–2006, GEOPHYSICAL RESEARCH LETTERS, VOL. 36, L16401, doi:10.1029/2009GL039407, 2009.

Meehan, W. R. and T. C. Bjornn. 1991. Salmonid Distributions and Life Histories. Chapter three in: Influences of Forest and Rangeland Management on Salmonid Fishes and Their Habitat, William R. Meehan, Editor, 1991.

NatureServe. 2009. NatureServe Explorer: An online encyclopedia of life. Version 7.1 NatureServe, Arlington, VA. Available http://www.naturserve.org/explorer. (Accessed: Nov. 29, 2011).

Nedeau E.J., A.K. Smith, J. Stone, and S. Jepsen. 2009. Freshwater Mussels of the Pacific Northwest SecEdition.The Xerces Society, Portland OR.

Neitzel D.A., T.J. Frest. 1990. Survey of Columbia River Basin Streams for Columbia Pebblesnail and Shortface Lanx. Fisheries. Vol. 15(2): 2-3.

Paulson, D. 1999. Dragonflies of Washington. Seattle Audobon Society, Seattle, WA. 31 pp.

Scheuering, E. 2006. Columbia Clubtail species fact sheet. Interagency Special Status/Sensitive Species Program (ISSSSP) webpage. USDA Forest Service/USDI Bureau of Land Management, Oregon and Washington. Available Online (http://www.fs.fed.us/r6/sfpnw/issssp/species-index/fauna-invertebrates.shtml).

Technical Reports

Clean Water Act (1972) and amendments. http://www.epa.gov/npdes/pubs/cwatxt.txt

Conservation and Recovery Plan for Oregon Steelhead Populations in the Middle Columbia River Steelhead Distinct Population Segment. Carmichael R.W., and B.J Taylor. Oregon Department of Fish and Wildlife (ODFW). 2009.

McKinney, S.P., J. O'Connor, C.K. Overton, K. MacDonald, K. Tu, S.Whitwell. 1996. A Characterization of Inventoried Streams in the Columbia River Basin. Aqua-Talk USDA 11:1-119.

National Marine Fisheries Service, 1996. Making Endangered Species Act Determinations of Effect for Individual or Grouped Actions at the Watershed Scale. Prepared by the National Marine Fisheries Service Environmental and Technical Services Division Habitat Conservation Branch. 33p.

National Marine Fisheries, 2011. Middle Columbia River steelhead 5-Year Status Reviews. Portland, OR [online]. http://www.nmfs.noaa.gov/pr/pdfs/species/middlecolumbiariver_steelhead_5yearreview.pdf. [Last accessed August 15, 2014)

National Marine Fisheries Service, 2011. 5-Year Review: Summary and Evaluation of Middle Columbia River Steelhead. Prepared by the National Marine Fisheries Service. 14p. http://www.westcoast.fisheries.noaa.gov/publications/status_reviews/salmon_steelhead/steelhead/5-yr-mcr.pdf

Section 7 Fish Habitat Monitoring Protocol for the Upper Columbia River Basin. U.S. Department of Agirculture, Forest Service, Pacific Northwest Region, 1994.

Umatilla National Forest. 1990. Land and Resource Management Plan, Umatilla National Forest, USDA Forest Service, Pacific Northwest Region, Pendleton Oregon.

USDA and USDI. 1995. Decision notice/decision record finding no significant impact: environmental assessment for the interim strategies for managing anadromous fish-producing watersheds in eastern Oregon and Washington, Idaho and portions of California (PACFISH).

USDA Forest Service, 2004. Biscuit Fire Recovery Project Final Environmental Impact Statement [online]. Available from www.fs.fed.us/r6/rogue-siskiyou/biscuit-fire/feis (accessed 10 March 2005).

USDA Forest Service, 2005. B&B Fire Recovery Project Final Environmental Impact Statement [online]. Available from www.fs.fed.us/r6/centraloregon/projects/units/sisters/b-b-fire/bb-final-feis.shtml (Accessed 17 October 2006).

USDA Forest Service, National Best Management Practices for Water Quality Management on National Forest System Lands, Volume 1, National Core BMP Technical Guide, FS 990a, April, 2012.

USDA Forest Service, Pacific Northwest Region, Aquatic and Riparian Conservation Strategy, August 13, 2008.

USDA Forest Service. 2012. General Water Quality Best Management Practices. Available on file at the Umatilla National Forest, Supervisors Office, Pendleton, Oregon.